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EXPERIMENT STATION RECORD

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EXPERIMENT STATION RECORD.

Vol. 42. JANUARY, 1920. No. 1.

The memorial exercises for the late Dr. Cyril G. Hopkins, held at the University of Illinois on January twenty-second, were a grateful tribute to an efficient public servant and a distinguished leader. They recorded the esteem and appreciation in which he was justly held, and beyond this they gave expression to a deep sentiment of personal regard which made the occasion an unusually impressive one.

These exercises were not merely the formal act of the university and his coworkers, but they were held before an audience composed quite largely of farmers and were participated in by representatives of the latter. The occasion was the annual convention of the corn growers and stockmen of the State, which brought together between four hundred and five hundred farmers representative of the class of practical men for whom Dr. Hopkins had especially labored. Many of them knew him personally and had profited by his counsel, while all knew of his work and the things he stood for.

There was something particularly fine and heartening in this tribute to one who did his work in agriculture. Too often the service of such a man has been accepted as a matter of course, and he has passed on without opportunity for those for whom he worked to express their homage and appreciation. Recognition has come rarely in such a simple, direct form as in this case, which showed that the speakers understood the meaning of his service and felt its personal quality. It was a case of honor in a man's own country.

The program was a varied one, covering the different aspects of his work and relationships, and included an afternoon and an evening session. The early work of Dr. Hopkins was brought out especially by Dr. L. H. Smith, his long time assistant and associate in these earlier efforts, who has continued the studies in corn breeding and selection; while Dr. Robert Stewart, professor of soil fertility in the College of Agriculture, explained the scientific basis and the evolution of the Illinois system of permanent agriculture. It was these two main features of crop and soil around which Dr. Hopkins' work chiefly centered, and they formed the basis for the plans under which one of the largest departments of agronomy in this country was built up. The loyal and efficient group of workers he assembled and the zeal and direction he imparted to them was in itself a mark of the character of the man and his ability, and was a large underlying element in his success.

Dr. Hopkins' year of service in Greece, as head of the agricultural division of the American Red Cross Commission to that country, was described in an interesting manner by Dr. George Bouyoucos, of the Michigan Agricultural College, who acompanied him and was with him when he died at Gibraltar on his way home. This culminating effort of Dr. Hopkins seems to have been characterized by all the energy and enthusiasm of his nature, and it is gratifying to know that it was felt to have been highly successful and aroused much public interest in that country. It developed a great need and opportunity, which made such a deep impression that the Greek Government is using earnest efforts to carry forward the plans he set in motion. Parenthetically it may be noted that, as an important part of its plan, the Greek Government is endeavoring to induce Dr. Bouyoucos to return to his native country to assume direct charge of this enterprise.

The significance of Dr. Hopkins' contributions to agriculture was briefly sketched by the writer, especially as exemplifying the qualities and essentials of agricultural experimentation and the application of its results in relation to agricultural advancement. He dealt with large questions, and he concentrated his efforts in accordance with a definite plan and purpose. His work was not scattered, although it embraced a wide field, but was centered in definite ends which he advanced step by step. His outlook was toward practice. He never lost sight of those he was ultimately working for, and he interpreted his work and that of others in the light of its practical applications, subjecting it to severe test and displaying in this the courage of his personal convictions.

In an inspiring address Acting President Kinley of the university set forth the spirit of service in the public servant as illustrated by Dr. Hopkins' guiding purpose and his public career; while Dean Davenport threw many interesting side lights on his character and nature as a man. These two addresses brought out his humanistic qualities, his high sense of duty toward the public, and a passion for service which amounted almost to a part of his religion. Dean Davenport also read extracts from a large number of letters showing how widely he was recognized and the esteem and affection in which he was held.

The most striking tributes of appreciation were paid by three farmers, who spoke of the practical significance of Dr. Hopkins' work, what it had meant to many of his followers in improving their system of farming, and the guidance and stimulating influence he had exercised in many directions. Their remarks were especially impressive because of the earnestness with which they acknowledged their debt to him, and the high degree of confidence and appreciation they expressed. Beyond this, they showed a strong personal regard and devotion to the man who had made their interest and their cause his own. No one could listen to these plain, simple words without being impressed with the hold he had won upon his farmer constituents, and the remarkable extent to which he had been accepted as their leader, counsellor, and friend.

This deep personal regard was further evidenced by the proposal to provide a permanent memorial to Dr. Hopkins, which sprang voluntarily from the farmers themselves. The plan was presented in brief outline at these exercises by Mr. Frank I. Mann, a member of the soils advisory committee and follower of Dr. Hopkins' work. The exact form which this may take is not fully determined upon, but the aim is to establish a trust fund of generous size to be used in carrying forward his work in such manner as may ultimately seem most advisable. A temporary organization has been effected to propagate the idea and serve as a basis for inviting subscriptions. If the venture should prove as successful as is confidently expected, it will be one of the most significant expressions of gratitude and appreciation which has come to any worker in this field.

Such a demonstration can not fail to bring gratification to all workers in the field of agriculture. It comes at a time when investigation is less prominently in the public mind than a few years ago, and temporarily is dropping behind in support;—when the forces of station workers have been greatly depleted, and all too few young men seem attracted to that field with its requirements of special preparation. It points to the opportunity for usefulness which such a career opens, and it shows that after all the public is not unappreciative or mindful of the service of its faithful servants, when the occasion comes for its expression.

When Dr. Hopkins went to the Illinois College of Agriculture, twenty-five years ago, it had not entered upon the era of development which a few years later placed it among the leading agricultural colleges of the country. The farmers had not yet been awakened to the importance of agricultural education or investigation, and they had done little for the development of either the college or the station. Subsequently he became prominently identified with this development, and the support he aroused was an element in making it possible. He assisted in organizing the farmers to understand and to present the needs of agriculture and of the college, and afterwards he used such organizations to promote his experimental work and to carry its teachings into effect.

Nearly half his life, representing its most productive period of activity, was spent in this work. The emolument from a monetary standpoint was meager; although it was fully up to the average for similar positions in other institutions, it was insignificant in comparison with what he might have received if he had chosen to accept the commercial positions offered him. But measured in the things that endure, the influence exerted, the aid extended to the industry, and the success of those who followed his teachings, the return was exceedingly large. These were the things he prized. They are the things which in large measure contribute to the satisfaction and compensation of the investigator working close to the problems of everyday life.

Some of the things he set out to do—to check the wasteful exploitation of soil fertility and point the way to permanent agriculture—are largely done, it may be; but there are other things remaining to be done which are quite as important, and in the end may bring just as large a measure of appreciation and satisfaction, and represent enduring service. Such considerations need to be weighed in taking account of the advantages and opportunities of an avocation. They may be an inspiration and stimulus to the student in choosing a career of service, in planning not only for making a living but for making a life.

There have been frequent requests from time to time that the pages of the *Record* be cut instead of furnished in untrimmed form as in the past. The advantage from the standpoint of current use has always been recognized, but the extent to which the numbers are preserved for binding and the desire of a considerable group that the copies be left uncut has led to the continuance of the plan which has been followed from the beginning.

In response to what now appears to be a quite widespread preference it has been decided to have the individual issues trimmed to uniform size, beginning with the current volume. Effort will be made to retain as wide a margin as possible in order to preserve the appearance when the volume is bound.

It is hoped that this change may add to the value of the *Record* by making its use more convenient and save the necessary time of cutting the pages. Many readers are especially interested in some particular department and wish to turn readily to it, while others like to run over the titles more generally. To assist the latter a new type has been adopted for the titles, which will make them somewhat more conspicuous.

These mechanical changes are aimed to facilitate the convenience of busy readers, of whom the number is steadily increasing. The spread of agricultural extension work and farm bureaus with permanent headquarters and libraries, and the establishment of large numbers of vocational schools under the Smith-Hughes Act in which agriculture is taught, have especially led to a growing call for the Record and given it a considerably wider range of readers. To many who might otherwise use the *Record* the uncut numbers are to some extent a sealed book, awaiting leisure to use the paper cutter and make its contents available. The practice of supplying periodicals with the pages already cut, avoiding the ragged edges of hand trimming, has become quite general, and with care in preserving a sufficient margin for binding it is hoped that the large majority of readers will be convenienced by the change.

Attention may oe called to the fact that a considerable number of the former issues of the *Record* are still available for distribution. The accumulated supply of back numbers has been somewhat scattered in storage, and some additional copies have recently come to light in connection with moving. Efforts have been made in the past to retain a small reserve stock from which new institutions, libraries, and other special requirements might be supplied, but difficulty in providing storage has made it necessary to reduce this reserve quite materially. These surplus numbers will be most useful to those who are preserving the *Record* and have a partial file which it is desired to complete.

The publication of the *Record* began in September, 1889. Since then forty-one volumes have been completed, aggregating four hundred and nineteen separate numbers in addition to the volume indexes, which were issued separately in most cases.

The supply of the individual numbers is quite variable. Some issues are entirely exhausted, while of others a considerable supply remains. In some cases complete volumes can be made up, but in others there are only scattering numbers.

The Office will be glad to furnish these back numbers to those on the mailing list who are preserving their files and wish to complete them. Applications will be given attention in the order in which they are received, and every effort made to meet the needs of individual applicants as far as the supply permits.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Notes on the composition of the sorghum plant, J. J. WILLAMAN, R. M. WEST, D. O. SPRIESTERSBACH, and G. E. HOLM (*Jour. Agr. Research* [*U. S.*], *18* (*1919*), *No. 1, pp. 1–31, figs. 18*).—This paper, from the Minnesota Experiment Station, reports analytical studies made on three varieties of sorghum (Minnesota Early Amber, Early Rose, and Dakota Amber), to determine the progressive changes in composition of the cane through the different periods of growth as shown in the composition of different parts of the plant itself and of the juice obtained from it. The results, which are presented in graphs, may be summarized as follows:

Considering the whole plant, there was found to be a continual increase in dry matter up to maturity. The percentage of crude fiber decreased at practically the same rate as that at which the soluble carbohydrates increased. The percentages of crude fat, ash, and protein remained almost constant during the periods of growth studied. This indicates that the plant builds up during the earlier part of the season its cellulose structure of fiber, protein, and mineral matter, and that the later stages of growth consist in the filling up of these tissues with carbohydrates (starch in the seed, sugars in the stalk). The analysis of the separate parts of the plant furnished no evidence to indicate that the leaves are deprived of their carbohydrates to supply the stalk.

The study of the composition of sorghum juice resulted in the identification of the following substances: Sugars, sucrose, dextrose, and levulose; organic acids, aconitic, citric, malic, tartaric, and oxalic; polysaccharids, starch, galactans and pentosans in gums, and xylose in the cellulose of pith; nitrogenous compounds, protein, *l*-leucin, *d-l*-asparagin, glutamin, and possibly cystin and aspartic acid.

The juice of suckers was found to be similar in composition to that of the main canes at the same stage of maturity, but the latter mature generally from one to three weeks earlier than the suckers. The middle joints of the cane were higher in total sugars and in sucrose but lower in dextrose and in levulose than the upper and the lower joints, the upper joints containing very little sugar and of a low coefficient of purity. At the time of the first appearance of the panicles the reducing sugars were greatly in excess of the sucrose, but the former decreased and the latter increased rapidly until at the stage of full bloom they were about equal in amount. At maturity the ratio of sucrose to reducing sugars in Minnesota-grown cane was about 70 to 30, as compared with a ratio of 90 to 10 in mature Virginia-grown cane. Removal of seed heads prior to maturity hastened the production of the maximum amount of sugar in the juice, but did not increase the maximum yield.

"Sorghum cane grown in Minnesota has a much lower sugar content than cane grown in regions of longer and warmer growing seasons. There are indications that if the advent of frost could be delayed, cane which is usually considered mature would continue for another week or 10 days not only to increase the ratio of sucrose to reducing sugars but to elaborate more total sugars. The juice of northern-grown cane has a higher purity than that of southern-grown. This is a phenomenon of early maturation exhibited by most plants when grown under suboptimum conditions."

A study of hydrocyanic acid in Phaseolus lunatus, J. A. SIMPSON (*An. Acad. Cien. Med., Fis., y Nat., Habana, 55 (1918–19), pp. 250–283, pls. 8*).—This investigation includes histological studies of several varieties of *P. lunatus* grown in Cuba and Porto Rico and determinations of their content of hydrocyanic acid. The method adopted by the author for determining hydrocyanic acid consisted in crushing the beans in water, heating them with sulphuric acid, and collecting the distillate in sodium or potassium hydroxid. The alkaline cyanid was then heated with calcium polysulphid, and subsequently titrated with a 5 per cent solution of ferric sulphate until the color of ferric thiocyanate developed. The method, if carried out with care, is said to be delicate to the extent of 0.00001 gm. of hydrocyanic acid.

One variety only of the many examined, "Rangoon blanca," was found to contain more than 40 mg. of hydrocyanic acid in 100 of the product. Several others contained between 3 and 8 mg. per 100, and the rest gave negative results.

The report closes with a résumé of the legislation in France and elsewhere concerning the sale of beans containing hydrocyanic acid.

Contribution to the chemistry of American conifers, A. W. SCHORGER (*Trans. Wis. Acad. Sci., Arts, and Letters, 19 (1919), pt. 2, pp. 728–766*).—This investigation of American conifers covers the determination of the analytical constants of 25 oils and the proximate analysis of 7 species of wood. The oils, only 3 of which had been examined previously by other investigators, included 10 needle oils, 3 cone oils, 9 oleoresins, 2 bark oils, and 1 wood oil. The woods examined consisted of 4 conifers, white spruce, Douglas fir, longleaf pine, and western larch, and 3 hard woods for comparison, sugar maple, yellow birch, and basswood.

The methods used in the analysis of the woods are described in detail, and a table is given of the results obtained.

The bactericidal power of some vegetable juices and essences, O. SARTI (*Ann. Ig. [Rome], 29 (1919), No. 1, pp. 4–14*).—The bactericidal power of the juices of garlic, onions, lemons, oranges, and mandarins, and of the ether extract of the evaporated juices, was tested by the thread method with various microorganisms, including anthrax spores.

The juices examined showed bactericidal properties of varying degree, most noticeably in the case of garlic and lemons, to a less degree in onions and oranges, and least in mandarins. The microorganisms tested showed varying resistance to the bactericidal action of the different juices. The bactericidal power of the juices of lemons, oranges, and mandarins proved to be due to their content of free acid, while that of onions and garlic was attributed to their content of essential oils.

The production and conservation of fats and oils in the United States, H. S. BAILEY and B. E. REUTER (*U. S. Dept. Agr. Bul. 769 Sup. (1919), pp. 7*).—This supplement to Bulletin 769, previously noted (E. S. R., 40, p. 614), consists of tables which contain the most recent figures on the fat and oil situation and which have been prepared to supersede the tables originally presented. This completes the report of the fats and oils survey conducted by the Government during 1917 and 1918.

Fat analysis and fat chemistry in 1916, W. FAHRION (*Ztschr. Angew. Chem., 30 (1917), No. 37, Aufsatzt., pp. 125–128; No. 39, Aufsatzt., pp. 138–140; No 41, Aufsatzt., pp. 142–144; No. 45, Aufsatzt., pp. 150–152; No. 47, Aufsatzt., pp. 157–159*).—This is a survey with references to the original literature, principally from German sources, of contributions to the chemistry of fats and oils published in 1916. The topics treated include fat production, fat determination, linseed oil substitutes, fat hydrogenation, sulphonated oils, fat cleavage, soap manufacture, special oils, synthesis and absorption of fats, and theoretical and technical papers.

The chemistry of essential oils and artificial perfumes, E. J. Parry (*London: Scott, Greenwood & Son, 3. ed., rev. and enl., 1918, vol. 1, pp. XI+521, figs. 52; 1919, vol. 2, pp. VII+344, figs. 10*).—In the revision and enlargement of this work on essential oils, the second edition of which has been previously noted (E. S. R., 21, p. 307), the material has been divided into two volumes. Volume 1 deals entirely with the essential oils in a series of monographs. Volume 2 consists of two parts, (1) the constituents of essential oils, synthetic perfumes, and isolated aromatics, and (2) the analysis of essential oils. A short supplementary chapter has been added to this volume dealing with recent work on a few essential oils, thus bringing the whole work up to date.

Chloretone: Tri chlor tertiary butyl alcohol.—A description of some of its properties, H. C. Hamilton (*Amer. Jour. Pharm., 91 (1919), No. 10, pp. 643–648*).—A brief description is given of the chemical properties of chloretone and its action as a general anesthetic, a hypnotic and sedative, a germicide, and an insecticide. Emphasis is laid upon its value as a general anesthetic for animal experimentation and as a preservative. Ten literature references are appended.

Preparation and testing of hydrogen of high purity, J. D. Edwards (*Jour. Indus. and Engin. Chem., 11 (1919), No. 10, pp. 961–963, fig. 1*).—A generator, designed by the author in cooperation with E. R. Weaver, is described and illustrated by means of which it is stated that hydrogen containing not more than 1 part in 10,000 of impurities can be prepared from zinc and acid. Methods of testing for contaminating gases are described, and the relation between the volume of gas generated and purity of the product is given by an equation which was verified experimentally.

Rapid and convenient method for the preparation of conductivity water, C. B. Clevenger (*Jour. Indus. and Engin. Chem., 11 (1919), No. 10, pp. 964–966, fig. 1*).—A modification of the Bourdillon still,[1] in use at the Wisconsin Experiment Station, is described and illustrated.

The basic principle on which the still operates is that the water is purified largely while in the vapor condition by means of a current of pure air as follows: Steam, from water to which phosphoric acid or potassium acid sulphate is added, first passes through a trap where substances less volatile than steam are condensed and eliminated, and then into a specially constructed condenser through which a rapid stream of purified air is passed. The modification differs from the original Bourdillon still mainly in that the parts are connected into a permanent unit.

The chief merits of the still as described are said to be that large amounts of good water can be secured easily by a single distillation, and that very little attention is required for its operation.

The Bourdillon water still, J. P. Bennett and J. G. Dickson (*Science, n. ser., 50 (1919), No. 1295, pp. 397, 398, fig. 1*).—This modification of the Bourdillon still is essentially the same as that described in the article by Clevenger noted above.

The determination of bromid in mineral waters and brines, W. F. Baughman and W. W. Skinner (*Jour. Indus. and Engin. Chem., 11 (1919), No. 10, pp.*

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[1] Jour. Chem. Soc. [London], 103 (1913), pt. 1, pp. 791–795.

954–959, fig. 1).—This paper describes an investigation conducted at the Bureau of Chemistry, U. S. Department of Agriculture, of various methods for the determination of bromin in brines, resulting in the recommendation of a new method of double aspiration, using chromic anhydrid and hydrogen peroxid for the oxidizing agents and collecting the liberated bromin, first in a solution of sodium sulphite and sodium carbonate and finally in potassium iodid. The first aspiration serves to concentrate the bromin content in an absorbing solution which changes the free halogen to halid. The absorbing solution is then subjected to a second treatment with chromic anhyrid resulting, on account of the small amount of chlorid present, in the evolution of pure bromin.

The apparatus employed and the technique of the procedure are described in detail.

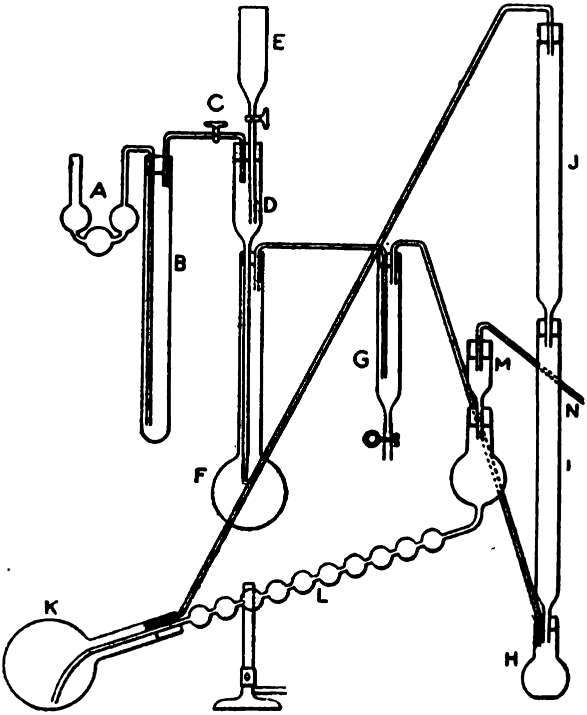

Fig. 1.—Apparatus for carbon determination.

An improved method for determination of carbon by wet combustion, using barium hydroxid as absorbent, P. L. Hibbard (*Jour. Indus. and Engin. Chem., 11 (1919), No. 10, pp. 941–943, fig. 1*).—A combination and modification of various methods for the determination of carbon by wet combustion is described which has been used by the author for over a year with much success. The essential features of the process are as follows:

The substance is heated in a Kjeldahl flask with chromic anhydrid and sulphuric acid to oxidize the carbon to carbon dioxid, which is carried into a solution of barium hydroxid by a current of purified air. After the reaction is completed, the excess of barium hydroxid is determined by titration with standard hydrochloric acid. The apparatus employed is shown in the accompanying diagram (fig. 1.). The bubble tube A contains a few drops of colored liquid to indicate the speed of the air current. The large tube B, filled with soda lime for purifying the incoming air, is connected by means of the regulating stopcock C with the funnel tube D leading into the Kjeldahl flask F, in which is placed the substance to be examined in amount sufficient to contain from 0.1 to 0.15 gm. of carbon. By means of the graduated dropping funnel E, 15 cc. of chromic acid solution is slowly run into the combustion flask, followed by 45 to 50 cc. of strong sulphuric acid. The flask is heated gently with a small flame until the acid boils, and the boiling is then continued for 15 minutes. The gas formed passes through a glass tube to the bottom of G, a tube which acts as the condenser to remove most of the water from the gas. After each combustion the water is drained out of this tube by opening the pinchcock. From G the gas passes to H, a 50 cc. wide-mouth flask containing about 10 cc. of strong sulphuric acid. This is connected with the tubes I and J, the former filled with glass beads wet with sulphuric acid to dry the gas, and the latter with granulated amalgamated zinc to remove the sulphuric acid or other acid fumes from the gas. The purified gas passes through a long tube to the 500 cc. Florence flask K, in which are placed 100 cc. of N/3 barium hydroxid and 50 or 60 cc. of carbon dioxid-free water. This absorption flask is connected with a Meyer bulb tube L, the large bulb of which is connected with the suction apparatus by means of a small safety trap M and a bent tube N.

In comparing this procedure with the gravimetric method using soda lime for absorption, the author states that in the volumetric method described the apparatus is somewhat simpler and more easily obtainable, there is no difficulty due to moisture, a larger number of units can probably be operated by one person than with the gravimetric process, and the error of determination is probably less. On the other hand, if but few determinations are to be made the gravimetric method is simpler as fewer reagents are required. The volumetric method is not suited for the combustion of volatile substances, but is applicable to the determination of carbon in soils, manures, and agricultural products in general.

A new and simple analytical method for the detection of important sulphur-oxygen compounds, A. Sander (*Chem. Ztg., 43 (1919), No. 42, p. 173*).—The method described, which is an extension of the previously noted method of the author (E. S. R., 35 p. 804) for determining thiosulphates in the presence of sulphites, bisulphites, and sulphids, depends upon the reaction of mercuric chlorid with various sulphur-containing salts as shown in the following table:

Reaction of mercuric chlorid with soluble sulphur-containing salts.

Compound.	Action of $HgCl_2$ in the cold.	Reaction of solution toward methyl orange.	Behavior of solution on heating.	Reaction after heating.
Sulphate		Neutral	Unchanged	Neutral.
Sulphite		Alkaline	Precipitate	Acid.
Bisulphite		Acid	Precipitate	Acid.
Sulphid	Precipitate	Neutral	Unchanged	Neutral.
Thiosulphate	Precipitate	Acid	Unchanged	Acid.
Polythionate	Precipitate	Acid	Unchanged	Acid.

The thiosulphate can be distinguished from the polythionate from the fact that the former on acidification precipitates sulphur and decolorizes an iodin solution, while the latter remains clear on acidifying and does not decolorize an iodin solution.

Simple method for measuring the acidity of cereal products: Its application to sulphured and unsulphured oats, V. BIRCKNER (*Jour. Agr. Research* [*U. S.*], *18* (*1919*), *No. 1, pp. 33–49*).—The author at the Bureau of Chemistry, U. S. Department of Agriculture, points out various inaccuracies in the Schindler method for measuring the acidity of cereal products (E. S. R., 23, p. 11), as modified by Besley and Baston (E. S. R., 36, p. 414), and describes a new method, the most important feature of which is the use of ice water instead of alcohol as the extraction solvent. The extraction, which should be carried on either in a cold-storage room or by immersing the tightly stoppered extraction bottles in a vessel of ice water, requires about one hour for oats and one and one-half hours for corn. For the subsequent titration with standard alkali, phenolphthalein is used as an indicator.

Comparative results obtained by this and the Schindler method on freshly ground samples of fresh and sulphur-bleached oats are reported, which indicate that with the Schindler method the increase in acidity due to sulphuring was hardly, if at all, apparent while with the ice-water method it was very marked. Samples of sulphur-bleached oats showed no increase in acidity upon prolonged standing in the ground state when tested with the ice-water method, but pronounced increases in acidity when tested by the Schindler method. This is explained on the ground that while the acid-forming ferments of the grain had been destroyed by the sulphur fumes, certain protein cleavage products continued to be formed which in aqueous solution are amphoteric, but which possess an acid reaction in the presence of alcohol.

Ice-water extracts of oats or corn, if filtered and kept at a temperature of from 1 to 2° C. for 24 hours without being neutralized, were found to undergo no change in acidity, but if neutralized a new formation of acid apparently takes place, notwithstanding the low temperature.

The acidity values of different varieties of sound unsulphured oats as determined by the ice-water method were found to vary but little from the same varieties during the early stages of spoilage. The results indicate, moreover, that certain constant acidity values are characteristic of the different varieties of oats although grown in different States and seasons.

The tincture of vanilla of the National Formulary, B. H. SMITH (*Jour. Indus. and Engin. Chem., 11* (*1919*), *No. 10, pp. 953, 954*).—The method of preparing tincture of vanilla as given in the fourth edition of the National Formulary (E. S. R., 36, p. 378) is described and criticized on the ground that alcohol of the strength called for (not less than 94.9 per cent by volume) removes a resinous extractive from the beans, which forms on dilution a cloudy precipitate not easily removed. Another disadvantage in the method as outlined is pointed out in the loss of alcohol which its use entails.

An apparatus for rapid gastric analysis, together with a method for the preservation of starch solution, R. J. MILLER (*Jour. Indus. and Engin. Chem., 11* (*1919*), *No. 10, pp. 963, 964, figs. 3*).—An apparatus, designed to meet the requirements for the determination of total acidity and free acidity and for the formol titration of the amino acid nitrogen, is described and illustrated.

A method of making starch solution is also described, in which the hot solution is placed in a previously scalded flask and protected from the air by a layer of liquid petrolatum. By withdrawing the solution with a siphon as needed there is no exposure to air, and the solution, if properly made, is said to keep indefinitely.

The determination of urea, PHILIBERT (*Jour. Pharm. et Chim., 7. ser., 19* (*1919*), *Nos. 10, pp. 335–349, figs. 2; 11, pp. 386–397, fig. 1; 12, pp. 434–441*).—The author reports a comparative study and criticism of various methods of determining urea, including the hypobromite method, the Folin method, and the Fosse xanthydrol method (E. S. R., 38, p. 110).

A modification of the hypobromite method is described, which consists essentially in comparing the volume of gas evolved in the usual procedure with the volume obtained from known amounts of urea determined under the same conditions. The ureometer employed, which is of such dimensions that double the amount of urine generally employed can be used, is provided with a shallow cup at the top. This is filled with water, and a gas receiver full of water is inverted over the opening leading into the ureometer tube. On opening the stopcock the gas formed in the reaction rises into the tube, which can then be removed under water and its volume measured. This modified hypobromite method is considered by the author to be at least equal, if not superior in precision, to the Folin procedure for the determination of urea in urines not containing sugar, and to be imcomparably superior for diabetic urines.

The titrimetric determination of phosphoric acid in sewage, W. Marzahn (*Hyg. Rundschau, 29 (1919), No. 15, pp. 525–527.*—In the method described the phosphoric acid is precipitated as ammonium phosphomolybdate, the precipitate dissolved in an excess of standard potassium hydroxid, and the excess potasium hydroxid titrated with sulphuric acid.

The estimation of fibers in paper, R. C. Griffin (*Jour. Indus. and Engin. Chem., 11 (1919), No. 10, pp. 968–970*).—The so-called count and estimation methods for estimating the percentage of different fibers in papers are described briefly, and results obtained with the latter method by different observers on standard samples are reported. From these the conclusion is drawn that the estimation method "may be expected to give results accurate to within 5 per cent or better on rag-sulphite mixtures, and within about 10 per cent or better on ground wood-sulphite and soda-sulphite mixtures."

Paper research literature, E. L. Matthews (*Paper, 24 (1919), No. 8, pp. 15–20; also in Tech. Assoc. Pulp and Paper Indus., Com. Bibliog. Contrib. 9 (1919), pp. 16*).—This is a bibliography of contributions to the literature on paper research by members of the Forest Products Laboratory, U. S. Department of Agriculture, during 1910 to 1918, with an appendix of contributions by other members of the service from 1877 to 1918.

Copra drying, A. J. Cox (*Ann. Rpt. Dir. Bur. Sci. Philippine Islands, 16 (1917), pp. 59, 60*).—A method for drying coconut meat for the production of copra is described, which consists briefly in putting the opened nuts on trays and subjecting them in a closed space to the fumes of burning sulphur, after which the nuts are put under a shed or in the sun to dry, the whole process requiring four or more days according to atmospheric conditions. This treatment is said to improve the keeping quality and to make an exceptionally white and uniform product, the oil from which is practically colorless and free from rancidity.

Copra and coconut products, B. J. Eaton (*Agr. Bul. Fed. Malay States, 6 (1918), No. 12, pp. 569–592*).—This is a résumé of the investigations on copra, coconut oil, and other coconut products reported by Cox et al. from the Philippine Bureau of Science (E. S. R., 39, p. 107), with a discussion of the bearing of these studies on the development of the coconut industry in the Federated Malay States.

METEOROLOGY.

Monthly Weather Review (*U. S. Mo. Weather Rev., 47 (1919), Nos. 7, pp. 447–522, pls. 23, figs. 43; 8, pp. 523–602, pls. 12, figs. 19*).—In addition to detailed summaries of meteorological, climatological, and seismological data for July and August, 1919, and bibliographical information, reprints, reviews, abstracts, and minor notes, these numbers contain the following contributions:

No. 7.—Kansas Tornadoes (illus.), by S. D. Flora; A Local Storm at Aberdeen Proving Ground, Md., July 6, 1919, by O. Neumer; Preliminary Meeting of Official Weather Bureau Directors at London, July 3–9, 1919, by L. A. Bauer; Meeting of International Union of Geodesy and Geophysics at Brussels, July 18–28, 1919, by L. A. Bauer; Stereoscopic Representation of Wind Movement Aloft (illus.), by R. C. Lane and R. A. Wells; Note on a Mirage at Sea, by M. S. Harloe; The Sun's Influence on the Diurnal Variation of the Atmospheric Potential-Gradient (illus.), by W. F. G. Swann; Radio Direction Changes and Variations of Audibility (illus.), by C. Kinsley and A. Sobey; Stratosphere Temperatures, by J. W. Redway and W. J. Humphreys; Mountain and Valley Winds at Syracuse, N. Y., by E. S. Clowes; Wind Shift in the Lower Three Kilometers of the Atmosphere on the Passage of a High (illus.), by W. Noll; Diurnal Variations in Humidity (illus.), by W. J. Bennett; Intense Rainfall at Dubuque, Iowa, July 9, 1919 (illus.), by J. H. Spencer; Heavy Rains at Tampico, Mexico, June 29–July 5, 1919, by S. A. Grogan; Northers on the East Coast of Mexico, Their Effects, and Forecast by Local Observations (illus.), by S. A. Grogan; Fog in Central Ohio and Its Relation to Subsequent Weather Changes, by H. H. Martin; The Use of Clouds in Local Forecasting, by M. L. Fuller; Highway Weather Service; Precepts for Forecasting River Stages on the Chattahoochee and Flint Rivers of Georgia (illus.), by C. F. von Herrmann; Weather in Cincinnati, Ohio, for 130 Years, by W. C. Devereaux; and Measurements of the Solar Constant of Radiation at Calama, Chile, May, 1919, by C. G. Abbot.

No. 8.—Effect of Winds and Other Weather Conditions on the Flight of Airplanes (illus.), by C. F. Brooks et al.; Balloon Race from Fort Omaha Through Thunderstorms (illus.), by C. L. Meisinger; The Constant–Elevation Free-Balloon Flights from Omaha (illus.), by C. L. Meisinger; The Trans-Atlantic Flight of the British Dirigible "R.34" (illus.), by W. R. Gregg; Normal Temperatures (Daily): Are Irregularities in the Annual March of Temperature Persistent? (illus.), by C. F. Marvin; Literature Concerning Supposed Recurrent Irregularities in the Annual March of Temperature, by C. F. Talman; Rainstorm of August 13–14, 1919, on Maryland–Delaware Peninsula (illus.), by A. H. Thiessen; Waterspouts on Lake Erie, August 19, 1919, by W. J. Willoughby; Hot Squall at Miami, Fla., May 6, 1917 (illus.), by R. W. Gray; A Hilltop Foehn, by C. F. Brooks; Relation of Clouds to Weather in Central Ohio, by H. H. Martin; Frost Control and Related Factors, by J. C. Whitten; and Measurements of the Solar Constant of Radiation at Calama, Chile, June and July, 1919, by C. G. Abbot.

The marine meteorological service of the United States (*U. S. Dept. Agr., Weather Bur., 1919, pp. 22, figs. 2*).—"The object of this pamphlet is to direct attention to the need for weather and water-temperature observations from as many ocean-going ships as possible, and to indicate to shipowners, captains, and supercargoes how much they can serve their own and others' interests through cooperation in meteorological work."

The pamphlet contains articles on History of American Marine Meteorology, by W. E. Hurd; The Present Commercial Value of Marine Meteorological Work, by F. A. Young; Some Specific Needs for Marine Observations, by F. G. Tingley; Marine Observations as the Basis for Daily and Seasonal Weather Forecasts, by C. F. Brooks; and Observations and Instruments, by W. E. Hurd.

[Free-air data], W. R. Gregg, T. J. Chancellor, and F. T. Cole (*U. S. Mo. Weather Rev. Sup. 15* (*1919*), *pp. 178, pls. 9, figs. 2*).—This is a record including notes, diagrams, and tables of data obtained during October, November, and December, 1918, in 53 kite flights of a mean altitude of 1,427 meters at Broken Arrow, Okla., 111 of a mean altitude of 2,847 meters at Drexel, Nebr., 123 of a mean altitude of 2,914 meters at Ellendale, N. Dak., 89 of a mean altitude of 2,476 meters at Groesbeck, Tex., and 82 of a mean altitude of 2,576 meters at Royal Center, Ind. The mean temperatures at the five places are summarized and attention is called especially to the temperatures, pressure distribution, and circulation of local winds, as shown by series of diurnal observations at Drexel, Ellendale, Groesbeck, and Royal Center. Computations of the gravity potential for different altitudes at the stations are given.

Motion of the air in the lowest layers of the atmosphere, G. Hellmann (*[Sitzber.] Preuss. Akad. Wiss. Berlin, No. 22,* (*1919*), *pp. 404–416; abs. in Sci. Abs., Sect. A—Phys., 22* (*1919*), *No. 259, p. 311; U. S. Mo. Weather Rev., 47* (*1919*), *No. 8, p. 574*).—"The ground wind is investigated by measurements of wind velocity at five different heights between 5 and 200 cm. above unobstructed ground near Berlin, and it is found that in this lowest layer the mean wind velocities are proportional to the fourth roots of the corresponding heights. The previous work of the author for heights varying from 200 cm. to 258 meters above the ground gave rise to a similar result, in which, however, the velocities were proportional to the fifth roots of the corresponding heights."

Climate of the cotton belt, O. C. Stine and O. E. Baker (*U. S. Dept. Agr., Atlas Amer. Agr., pt. 5, Sect. A* (*1918*), *pp. 9, 10, figs. 12; also in U. S. Mo. Weather Rev., 47* (*1919*), *No. 7, pp. 487–489, figs. 12*).—It is stated that the average summer temperature along the northern boundary of the Cotton Belt is 77° F. "In the southern portion of the Cotton Belt the summer temperature is 80 to 85°, and in the Imperial Valley of California it averages 95°. Along the northern margin of the Cotton Belt the last killing frost in spring occurs, on the average, about April 10, and the first killing frost in fall about October 25, so that the frostless season is about 200 days. In the southern portion of the Cotton Belt the last killing frost in spring occurs about March 10, on the average, and the first killing frost in fall seldom before November 25, the frostless season being 260 days or more in length.

"The average annual precipitation in the Cotton Belt ranges from 23 in. in western Oklahoma and Texas to 55 in. in eastern North Carolina and 60 in. in southern Mississippi, but throughout much of the Belt is between 30 and 50 in. The spring rainfall ranges from 6 in. in western Texas to 16 in. in Arkansas and southern Mississippi, being heavier in the Mississippi Valley States than in Texas or the south Atlantic States. The summer rainfall is somewhat greater than that of the other seasons, especially in the southern and eastern portion of the Belt, reaching a maximum of 20 in. in southern Mississippi and in eastern North and South Carolina; while in the Black Prairie of Texas the amount received averages only 8 in. Autumn is the driest season of the year, practically all the important cotton regions receiving less than 10 in. of rain during the fall months. February and November are the wettest months in the Mississippi Valley States, in Alabama, and in northern Georgia. August is the wettest month in the Carolinas and May in Texas and Oklahoma. October and November are the driest months throughout practically the entire Cotton Belt.

"The best conditions for cotton production are found where a mild spring with light but frequent showers merges into a moderately moist summer, warm both day and night, followed by a dry, cool, and prolonged autumn."

Meteorological observations, 1918, P. Nelson (*Guam Sta. Rpt. 1918, pp. 59–61*).—The equipment of the station for making meteorological observations is described, and observations on temperature, precipitation, humidity, cloudiness, and winds are summarized for each month from July, 1917, to June, 1918, inclusive.

The mean temperature for the period was 80.88° F. The absolute maximum was 97.5° July 9, 1917, and the absolute minimum 68° January 3, 1918. A temperature of 90° or over was recorded on 80 days during the year. The rainfall was 65.6 in. during 144 days in the so-called wet season and 35.62 in. in 113 days during the dry season. The year was unusual in that it did not have a definite wet and dry season. "No month had less than 2.5 per cent of the total for the year; four months had 5 per cent or less, five months had 5 to 10 per cent, while three months had 11.5, 14.9, and 20.6 per cent, respectively. There were not less than 15 days with rainfall in any month, and the greatest number of days with rainfall recorded was 29. The maximum rainfall for 24 hours amounted to 4.47 in., which was recorded on February 19, 1918." The year was also unusual in that no high winds occurred. "As a rule, during the period from July to December, or in the 'wet season,' stormy weather due to typhoons or hurricanes in the vicinity of the island is encountered."

SOILS—FERTILIZERS.

Soil survey of Drew County, Ark., B. W. TILLMAN, F. A. HAYES, and F. Z. HUTTON (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 48, fig. 1, map 1*).—This survey deals with the soils of an area of 542,080 acres in southeastern Arkansas consisting of rolling upland, flatwoods upland, and stream flood plains. The rolling upland is generally well to excessively drained, the flatwoods have inadequate drainage, and the bottom lands are poorly drained and subject to overflow.

The upland soils consist of weathered deposits of the Coastal Plain, the bottom-land soils are of recent alluvial origin, and the flatwoods soils are very silty. Sixteen soil types of nine series are mapped, of which the Caddo silt loam, Susquehanna silt loam, Ochlockonee silt loam, and Portland clay cover 30.9, 11.4, 10.2, and 8.9 per cent of the area, respectively. It is stated that in general the soils of the county are deficient in organic matter.

Soil survey of Blackhawk County, Iowa, W. E. THARP and H. J. HARPER (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 44, pls. 2, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station, deals with the soils of an area of 361,600 acres situated about midway between the center and the northeastern corner of Iowa. The surface consists chiefly of rolling upland.

"The prevailing soil types are dark-colored loams and silt loams of loessial or glacial origin. They are quite high in organic matter and comparatively rich in the essential mineral elements. All the types are acid in the surface soil, and few have calcareous material within the 3-ft. section." Including muck and meadow, 29 soil types of 13 series are mapped, of which the Tama silt loam and the Carrington loam cover 31 and 27.6 per cent of the area, respectively.

Soil survey of Baltimore County, Md., W. T. CARTER, JR., J. M. SNYDER, and O. C. BRUCE (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 42, fig. 1, map 1*).—This survey, made in cooperation with the Maryland Geological Survey and the Maryland Experiment Station, deals with the soils of an area of 430,720 acres in northeastern Maryland, the topography of which varies from nearly level or undulating to strongly rolling and hilly, the greater part being strongly rolling. The area lies principally within the Piedmont Plateau. All the drainage is into Chesapeake Bay.

The soils are of residual, alluvial, and Coastal Plain origin. Including tidal marsh and unclassified city land, 22 soil types of 14 series are mapped, of which the Chester loam and Manor loam cover 26.7 and 22.5 per cent of the area, respectively.

Soil survey of Chase County, Nebr., R. F. Rogers and L. A. Wolfanger (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 66, fig. 1, map 1*).—This survey, made in cooperation with the University of Nebraska, deals with the soils of an area of 575,360 acres in southwestern Nebraska, lying within the Great Plains region. The surface of the area varies from flat or slightly undulating to rolling and hilly.

The soils are of residual, alluvial, and eolian origin. "The surface soils are prevailingly brown, with grayish or pale yellowish gray lower subsoils. In general the soils have a loose, friable structure, although the heavier types may be moderately compact at the surface. The material is usually calcareous, particularly in the subsoil, but there is practically no accumulation of injurious alkali except in a few places in the first bottoms. The organic content of the soils is rather high for a semiarid region, but low as compared with that of most prairie soils of humid regions."

Including Dunesand, 22 soil types of 9 series are mapped, of which Dunesand, Rosebud loam, and two phases of Colby very fine, sandy loam, cover 33.5, 14, and 10.5 per cent of the area, respectively.

Soil surveys of Schoharie and Cortland Counties, N. Y., E. T. Maxon and G. L. Fuller (*N. Y. State Col. Agr., Cornell Ext. Bul. 24 (1917), pp. 81–114, pls. 4, fig. 1, map 1; 29 (1918), pp. 161–188, fig. 1, map 1*).—These surveys have been previously noted (E. S. R., 37, p. 514; 38, p. 216).

Soil survey of Canadian County, Okla., E. H. Smies (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 60, fig. 1, map 1*).—This survey deals with the soils of an acre of 570,240 acres situated just west of the center of Oklahoma and which lies in the Great Plains region. The surface is generally undulating to gently rolling, but small areas are more strongly rolling. Drainage systems on the whole are well established.

The upland soils are classed as residual prairie soils and soils largely of wind-blown origin. The bottom-land soils are divided into terrace soils and first bottom soils. In addition to Dunesand and Rough stony land, 26 soil types of 9 series are mapped, of which the Derby and Vernon, very fine sandy loams, covered 16.1 and 15.8 per cent of the area, respectively. The Derby series is the most extensive.

Soils, G. Briggs (*Guam Sta. Rpt. 1918, pp. 44, 45, pls. 2*).—Chemical analyses of 40 samples of newly broken grasslands at the station, eight of which are reported, and pot tests of the fertilizer requirements of these soils led to the tentative conclusion that the difference in the productivity of these soils and the older and more productive soils of the station "is due to a physiological condition, the grass roots apparently excreting a toxic substance that is poisonous or detrimental to other plants, or at least to some others."

Survey of the more important soil types of Wurttemberg and their original rocks, F. Plieninger (*In Festschrift zur Feier des 100 Jährigen Bestehens der K. Württenb. Landw. Hochsch. Hohenheim. Stuttgart: Eugen Ulmer, 1918, pp. 152–189*).—This survey deals with the geological origin of the soils of Wurttemberg.

Peat in the Dismal Swamp, Virginia and North Carolina, C. C. Osbon (*U. S. Geol. Survey Bul. 711–C (1919), pp. 41–59, pls. 3*).—This report deals with the geography, geology, origin, distribution, and physical and chemical properties of the peat of Dismal Swamp.

In the 1,500 square miles of undrained area of Dismal Swamp, peat deposits ranging in depth from 1 ft. to 20 ft. are found. The thickest beds lie in the region east and northeast of Lake Drummond, where peat 18 ft. deep was exposed by comparatively recent excavations. The peat in this area is black and low in inorganic impurities, and is probably the best in the swamp. In general, the depth of the peat gradually decreases toward the edge of the swamp, where the peat finally merges into the sands of the adjoining areas. The eastern border is deeply indented by large tracts that have been drained, cleared, and cultivated. Some peat of value is found in the southern and southeastern parts of the morass, but the northern and western parts contain few deposits large enough to be of commercial importance.

"On the assumption that the uncultivated area of the Dismal Swamp is 1,500 square miles, that about one-half of this area is covered with peat averaging 7 ft. in depth, and that, according to the usual practice in estimating the tonnage a bog will yield, 200 tons of dry peat per acre-foot may be obtained, then the total available peat in the Dismal Swamp is 672,000,000 tons. . . . The two leading kinds of peat in the Dismal Swamp are known locally as 'black-gum peat' and 'juniper peat.' The former, which is dark brown or black, thoroughly decomposed, and relatively homogeneous in structure, is found in what were formerly the wetter parts of the region, especially near Lake Drummond, and . . . is well humified and almost destitute of fibrous structure. When dry it breaks easily, leaving lusterless fracture surfaces. 'Juniper peat,' which ranges from dark to light brown in color and is rather fibrous, is found in the light or open swamp. . . . Decomposition is not far advanced and the peat contains many stems, roots, and logs."

Analyses of samples of these peats show that "'black-gum peat', because of its thorough decomposition, contains more nitrogen and fixed carbon than 'juniper peat' and therefore is less acidic. It also contains less ash and is of greater commercial value. Where the ash content exceeds 8 per cent it consists chiefly of alumina and silica in the form of clay and sand." The black-peat soils are considered to be the more important from the agricultural viewpoint.

The improvement of wild meadow and tule land, W. L. Powers (*Reclam. Rec. [U. S.], 10 (1919), No. 11, pp. 517–520, figs. 2*).—This is a report on work and studies relating to the improvement of soils representative of several million acres of the intermountain Great Basin region.

The wild meadow soils consist mainly of peat and silt loam soil types. "Mechanical and chemical analyses from different marshes show that these dark silt loam soils are uniform in texture and of good fertility. Their usable water capacity is nearly two acre-inches per acre-foot under field conditions, while for the peat it is nearly twice as great. In some cases the percentage of phosphorus is rather below average.

"Fertilizer trials conducted the past four seasons on three different marshes do not show a profitable increase from the application of either phosphorus or potash. Lime has benefited alsike clover on these lands, but has aggravated the alkaline condition due to an increase in carbonate. The clay loam on the marsh rims has responded markedly to application of elemental sulphur where crops such as alfalfa have been grown. There are some indications that potash will help on the deep peat and that phosphorus will need to be supplied in the long run on the soils of the wild meadow area."

Flood water is spread out over marsh lands by wild flooding from canals led along the contour lines. "Where the flood water can be controlled it is believed the strip border method of irrigation will be suitable for large parts of this wild meadow land. It has been tried with success on meadows under investigation. With this method the water can be more evenly applied in periods and the soil permitted to warm up and aerate between applications."

Four years' water variation trials, conducted under field conditions in three marsh areas in south-central Oregon and checked by the use of large soil tanks, showed that "an average depth of 18 in. of water on the field could produce maximum yields at present secured or a little more than the most profitable yields of hay crops on the marsh lands. The greatest yields of wild hay per acre-inch have been secured frequently with a net use of 12 in. depth of water per acre. The yield per acre-inch becomes more important where water is limited and the land area available for irrigation is in excess of the water supply."

The importance of nonsymbiotic nitrogen-fixing soil bacteria for plant nutrition, M. Düggeli (*Vrtljschr. Naturf. Gesell. Zürich, 62 (1917), No. 1-2, pp. 394-422*).—Experiments are reported with heavy loam soil and different crops which showed that such soil, when fertilized with soluble phosphoric acid and potash but no nitrogen, contained much greater numbers of nonsymbiotic nitrogen-fixing bacteria of aerobic types, such as *Azotobacter chroococcum*, and more or less anerobic types, such as *Bacillus amylobacter*, than the same soil fertilized with sodium nitrate. In the latter a greater number of denitrifying bacteria were found than in the former. It was also found that this soil, when given full fertilizer and cultural treatment except available nitrogen after the third year produced increasing crops without evidence of nitrogen deficiency. These results are taken to indicate the value of the nonsymbiotic nitrogen-fixing bacteria in supplying available nitrogen to growing crops.

Rate of nitrification of different green manures and parts of green manures and the influence of crop residues on nitrification, N. V. Joshi (*Agr. Jour. India, 14 (1919), No. 3, pp. 395-413, pls. 4, fig. 1*).—Studies on what actually happens to green manure when incorporated in a soil are reported. For this purpose six leguminous plants were chosen, as follows: *Crotalaria juncea, Sesbania aculeata, Tamarindus indica, Cyamopsis psoralioides, Vigna catjang*, and *Clitoria ternatea*.

The plants were allowed to grow for six weeks, when they were uprooted and the percentage of nitrogen determined in each case after proper sampling. Whole plants were taken, root and all. Green plants were cut to pieces, averaging about half an inch, and these were separately added to each kilogram of air-dry Pusa soil at the rate of 30 mg. of organic nitrogen in the form of green manure per 100 gm. of dry soil. Water was added to the soil so as to bring the moisture content of the soil up to 16 per cent. Samples for analysis were taken, after thoroughly mixing the soil to determine the amount of ammonia, nitrite, and nitrate formed at the end of each week for the first four weeks, after which time determinations were made after an interval of two weeks.

It was found that the failure of green manure to nitrify, as in the case of tamarind (*T. indica*) or parts of green manure such as stems and roots in all kinds of green manure experimented with, may occur under optimum conditions of moisture and temperature, and rate of application. It was further found that of the different parts of green manure, leaves nitrify quickly while roots and stems show practically no nitrification.

It is concluded that "most of the immediate effect of green manures is due to the nitrogen contained in the leaves being quickly nitrified, and also that the effect of a leguminous crop on the succeeding cereal crop is due mostly to the fall of leaves from the leguminous crop. The failure to nitrify, so far as ascertained, does not depend on the nature of the nitrogenous materials. It is probably due to nitrate reduction, occurring in presence of great quantities of nonnitrogenous materials such as cellulose and woody tissue."

Denitrification on account of the presence of difficultly decomposable organic substances, O. NOLTE (*Centbl. Bakt.* [*etc.*], *2. Abt., 49 (1919), No. 7–9, pp. 182–184*).—Pot culture experiments with mustard on light sand soil to which the residue from quinin manufacture was added in amounts of 5.1 and 20 per cent showed that in all cases the resulting crop suffered from a deficiency in nitrogen. In further experiments with sand soil to which was added the residue and different amounts of nitrate nitrogen, it was found that after 8 and 16 days there was a marked decrease in nitrates present. These results are taken to indicate that the woody residue from the manufacture of quinin (chinarind) serves as a medium for the growth of denitrifying bacteria, and that denitrification increases with increasing deficiency in oxygen.

Fertilization and sterilization, A. VEAUVY (*Bul. Agr. Algérie, Tunisie, Maroc, 2. ser., 25 (1919), No. 3, pp. 57–68*).—This article discusses the soil as a medium for the life of bacteria, and connects soil fertility directly with the life of soil bacteria. Soil sterilization by improper cultivation, irrigation, and fertilizer applications, and fertilization by these treatments properly applied are discussed in some detail.

The conservation of plant food, C. D. WOODS (*Rpt. Proc. Conn. Dairymen's Assoc., 36 (1917), pp. 80–101*).—The author deals in general with the relation between live-stock farming and soil fertility with reference to the conservation of manure, including the results of the experiment previously noted (E. S. R., 37, p. 628).

Experiments on the water absorbing properties of peat moss litter, W. M. VIERSEN (*Cultura, 30 (1918), No. 363, pp. 353–357*).—Experiments on 21 samples of peat moss litter led to the conclusion that this material is eminently satisfactory as an absorbent for water or other liquids coming in contact with it. The experimental methods are described.

Preliminary report on the mineral resources of the United States in 1918, E. S. BASTIN and M. B. CLARK (*U. S. Geol. Survey, Prelim. Rpt. Min. Resources U. S. 1918, pp. 106, fig. 1*).—This pamphlet is the first of a new class of reports, the purpose of which is to present as nearly as possible the progress of the mineral industry for the year in which issued. This number contains data on the production and sale of lime, marl, phosphate rock, peat, and potash in the United States for 1918, most of which data has been noted from other publications of the Geological Survey.

A survey of the fertilizer industry, E. A. GOLDENWEISER (*U. S. Dept. Agr. Bul. 798 (1919), pp. 29, pls. 2, fig. 1*).—This is a report of a survey on the production and marketing of fertilizers and fertilizer materials in the United States during the years 1917 and 1918.

The principal materials used during the two years in mixed fertilizers were acid phosphate, potash-bearing materials, and nitrogenous materials. A certain quantity of agricultural lime, salt, and filler was also reported. "The companies used more than 2,200,000 tons of phosphate rock in the manufacture of acid phosphate during 1917, as compared with only 72,000 tons of steamed ground bone, and 32,000 tons of raw ground bone with small quantities of other phosphatic materials. The quantity of sulphuric acid used is approximately the same as that of the phosphorus-bearing materials. . . .

"The total production of phosphate rock amounted to 2,696,000 short tons in 1918 as compared with 2,588,000 short tons in 1917. . . . The greatest production was of Florida land pebble (2,142,000 tons), which alone comprised about four-fifths of the entire output. Tennessee brown rock, of which 378,000 tons were mined, is next in importance. The production of but two of the other kinds amounted to 50,000 tons. . . . The great mass of the rock marketed during the period was in the form of Florida land pebble, of which 774,000 tons were marketed during the first six months of 1918, and the next most important quantity was of Tennessee brown rock. . . .

"The total amount of ammonia used during 1917 was more than 18,600,000 units of 20 lbs., and the total amount used during 1918 exceeded 15,000,000 units. The principal source of ammonia during both years . . . was sodium nitrate, nearly 30 per cent of the ammonia being derived from that one source. The second source in importance was ammonium sulphate, from which about one-sixth of the ammonia was derived. Among the organic sources of ammonia, tankage and cottonseed meal are by far the most important. The proportion of ammonia derived from animal tankage of high and of low grade was less in 1918 than in 1917, owing, probably, to the great demand for tankage as feed. The proportion derived from cottonseed meal increased from 13.8 per cent in 1917 to 15.3 per cent in 1918. Nearly four-fifths of the ammonia in fertilizers is thus derived from the two great mineral sources, sodium nitrate and ammonium sulphate, together with the two principal organic sources, tankage and cottonseed meal. . . .

"The total potash produced during 1918 . . ., including estimates for the last three months, was 53,500 tons. . . . More than four-fifths of the potash is derived from mineral sources, and among these sources lake brines alone account for considerably over-two-thirds of the potash. The next most important source in 1918 was kelp, the giant seaweed of the Pacific coast, from which over 5,000 tons of K_2O was derived during the year. Some of the other important sources are alunite, beet-sugar factory waste, cement dust, and tobacco waste. . . .

"The quantity of mixed fertilizer produced was 4,443,000 tons in 1917 and 4,958,000 tons during 1918."

A table shows that "218 grades were manufactured in quantities of 1,000 tons or more. These 218 grades comprised over 95 per cent of the total mixed fertilizer produced," while the remainder "was distributed in small quantities among 724 grades." Data are also included on stocks of fertilizer materials on hand.

The 1919 yearbook of commercial fertilizer (*Yearbook Com. Fert., 1919, pp. 234, figs. 21*).—This book gives a directory of fertilizer manufacturers in the United States and Canada, lists the agricultural experiment stations and the officials in charge of State fertilizer laws, lists prices of fertilizer materials for 1917 and 1918, and contains several special articles on subjects relating to the manufacture and use of fertilizer and fertilizing materials, among the more important of which are the following: Possibilities of Fewer Fertilizer Formulas in the Southeast, by J. N. Harper; The Place of Fertilizers in the Southwest, by J. C. Pridmore; Limitations of Legumes as Sources of Nitrogen, by C. A. Whittle; Comparative Value of Phosphate Carriers, by T. K. Wolf; Relation of Fertilizers to Food Production in the United States, by E. J. Pranke; The Future of American Potash, by G. E. Condra; The Production of Sulphate of Ammonia for 1918, by C. G. Atwater; Review of Domestic Potash Production, by W. B. Hicks; Post-war Position of British Sulphuric Acid and Fertilizer Trades, by J. W. Davis; American Potash Developments, by A. W. Stockett; and Artificial Fertilizers in Japan, by E. R. Dickover.

The American fertilizer handbook, 1919 (*Amer. Fert. Handb., 12 (1919), pp.* [*499*], *illus.*).—This handbook contains directories to fertilizer manufacturers and allied fertilizer trades, fertilizer machinery and equipment, chemists and engineers, cottonseed oil mills, and packers and renderers; gives data on the production and use of phosphate rock and other fertilizer materials; and includes several special articles relating to the production and use of fertilizer materials, among the more important of which are the following: Fertilizer Materials Statistics; The Year's Work of the Soil Improvement Committee of The National Fertilizer Association, by J. D. Toll; Standard Fertilizer Analyses, by S. B. Haskell; The Sulphuric Acid Industry, by A. M. Fairlie; Sulphur and Pyrites in 1917, by P. S. Smith; Potash in 1917, by H. S. Gale and W. B. Hicks; American Potash in 1918, by W. B. Hicks; and British Fertilizer Trade During the War Period.

Fertilizers, [I]–VII, B. DE C. MARCHAND (*So. African Jour. Indus., 1 (1918), Nos. 10, pp. 891–902; 11, pp. 1018–1031; 12, pp. 1121–1129; 13, pp. 1223–1227; 14, pp. 1319–1328; 15, pp. 1435–1442; 16, pp. 1521–1529, fig. 1*).—This series of articles gives data on the supplies and sources of all manufactured fertilizers in the Union of South Africa.

Fertilizers and their relation to crop production in Virginia, T. B. HUTCHESON, T. K. WOLFE, ET AL. (*Virginia Sta. Bul. 221 (1919), pp. 5–74, figs. 15*).—This bulletin contains a general discussion on fertilizer materials, with special reference to sources and functions of the essential elements and to mixing, and reports a number of fertilizer experiments with different crops to show the relation of fertilizers to crop production in Virginia.

The tests with alfalfa indicate that the chief fertilizer requirements for alfalfa are lime, phosphates, and organic matter.

It is believed that the most profitable way to fertilize the corn crop is to establish a good rotation and apply the fertilizer to some crop in the rotation rather than applying it directly to the corn crop. " In applying fertilizers to corn they should seldom be distributed in the furrow directly under the row, but should be scattered broadcast over the entire surface of the field, either by hand or by a distributor similar to the fertilizer attachment of a wheat drill. . . . Nitrogen applied directly to corn gave profitable returns. . . . An application of nitrogen in the form of nitrate of soda in addition to the 28.8 lbs. of nitrogen supplied by tankage, gave an increase in yield of 6.67 bu. of corn per acre. . . . Nitrate of soda gave better returns when applied just before planting the corn crop than later—at the last cultivation."

For cotton " the use of nitrogen in organic form as blood or cottonseed meal, is recommended in places of nitrate of soda or sulphate of ammonia. . . . The most profitable fertilizer for cotton when grown in a rotation, . . . is one containing nitrogen, phosphoric acid, and potash."

It was found that for grass a fertilizer containing phosphoric acid and nitrogen gave the best results, and on all soil types of the State it is stated that lime is needed for grass. It is believed that it is better to grow peanuts in rotation and apply fertilizers to some other crop in the rotation.

The results of fertilizer experiments on gray soil growing dark tobacco and wheat showed that " ammonia from two or more sources ordinarily gives better results on tobacco, corn, and other cultivated crops than fertilizers containing nitrate of soda or sulphate of ammonia alone as a source of this plant food. Phosphoric acid is deficient in the soils of this section of the State, and material containing this ingredient should be applied liberally. Potash where used alone produces very little or no results, but shows good results when used in connection with acid phosphate or ammonia or both combined. Lime in connection with a judicious rotation liberates potash for the use of growing crops. Cowpeas are detrimental to the growth of tobacco and should not be used in the tobacco rotation.

"It is necessary that the soil contains a liberal humus supply if the greatest profits are realized from general farm crops. Soils in this section are very deficient in lime, and to get the best results from clover, alfalfa, and other leguminous crops it is absolutely necessary that lime be applied. Its use is the most economical means of soil improvement in promoting the growth of soil-improving crops. Lime should not take the place of fertilizers, but rather should be used in connection with fertilizers for desirable results."

A table of fertilizer formulas for general crops is included.

Some preliminary experiments with manures on Borbhetta soil (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 1* (*1919*), *pp. 28–34*).—General fertilizer and cultivation experiments on these soils, which are apparently newly opened grasslands, indicate that drainage and cultivation are desirable preliminary treatments, and that phosphate manuring, moderate liming, and nitrogenous manuring with such organic manures as oil cake and dried blood increase the fertility, particularly for tea. No certain results have been obtained from potash fertilization.

Views on the nitrogen question and related problems, L. HAMBURGER (*Chem. Weekbl., 16* (*1919*), *No. 17, pp. 560–595*).—This is an extensive review and summary of available data on the nitrogen fixation question.

The prevention of volatilization of ammonia nitrogen by calcium chlorid, A. STUTZER (*Fühling's Landw. Ztg., 68* (*1919*), *No. 3–4, pp. 59–63*).—Experiments on the action of several alkaline sulphates and chlorids to prevent the volatilization of ammonia nitrogen from a solution of ammonium carbonate showed that calcium chlorid was the only one tested which had any appreciable action in this respect. Further experiments showed that the action of calcium chlorid in conserving ammonia nitrogen is approximately the same in dilute as in strong solutions of ammonium carbonate.

It was found that two parts of calcium chlorid to one part of volatile ammonia nitrogen conserved approximately 25 per cent of the nitrogen, while four and six parts of calcium chlorid conserved 50 and 75 per cent, respectively. With reference to similar experiments with liquid manure, it is pointed out that this material usually contains a small amount of potassium or sodium carbonate which may interfere with the action of the calcium chlorid. The best results have been obtained when six parts of calcium chlorid were used for each part of nitrogen in the liquid manure.

Comparison of two fertilizers according to the Mitscherlich law of minimum, M. GORSKI (*Landw. Vers. Sta., 93* (*1919*), *No. 3–4, pp. 113–120*).—Pot experiments with oats on sandy soil to compare the relative influences of ammonium sulphate and sodium nitrate are reported.

It was found that the results obtained with increasing additions of ammonium sulphate and sodium nitrate corresponded very well with the mathematical expression of Mitscherlich. It was established that the working factors for yields of grain and straw could be the same only when the ratio of grain yield to straw yield, with different amounts of the in-minimum factor, remained constant, otherwise the working factors vary. The relation of the working factors for ammonium sulphate and sodium nitrate was found to remain constant whether the working factors, grain or straw, were used for computing the relation.

Experiments on the fertilizing value of Vivianite and Vesta phosphate, J. GRAFTIAU and M. F. COURTOY (*Ann. Gembloux, 25* (*1919*), *No. 1, pp. 19–27*).—Pot culture experiments with corn and cabbage on a semiclay soil mixed with layers of sand to determine the fertilizing value of so-called Vivianite and Vesta phosphate as compared with superphosphate are reported. The Vivianite is an iron phosphate, containing between 1 and 13.5 per cent of total phosphoric acid. The Vesta phosphate is a product obtained by the calcination at high temperature of a mixture of cretaceous phosphate and of phonolite, and contains about 7 per cent of phosphoric acid soluble in alkaline ammonium citrate. It was found that the Vesta phosphate gave results generally superior to those given by superphosphate, while the Vivianite gave relatively poor results, which were lowered even more by drying the Vivianite at 110° C.

The residual effect of superphosphate, G. S. Gordon (*Jour. Dept. Agr. Victoria, 16 (1918), No. 10, pp. 610–617, figs. 4*).—Observations on the residual effect of Thomas phosphate and superphosphate over a period of five years in a shallow, light red to gray loam soil, overlying clay, and growing wheat, are reported. The Thomas phosphate was added at rates of 50 and 100 lbs. per acre and the superphosphate at rates of 50, 100, 150, and 200 lbs. per acre.

It was found that the results from Thomas phosphate were not nearly so marked as those from superphosphate, and it is noted that the phosphoric acid contained in the latter had apparently neither leached out during a wet season nor reverted to unavailable forms.

The potash fields of Alsace, A. Witz (*Rev. Gén. Sci., 30 (1919), No. 15–16, pp. 477–488, fig. 1*).—This report describes the general occurrence of the potash beds in Alsace and their commercial exploitation, dealing also with related financial and economic considerations.

Report of analyses of commercial fertilizers (*La. Dept. Agr. and Immigr. Fert. Rpt. 1917–18, pp. 59*).—This reports analyses of 1,513 samples of fertilizers and fertilizer materials made at the Louisiana Experiment Stations for the year 1917–18 under the State fertilizer law.

Analyses of commercial fertilizers, R. N. Brackett and H. M. Stackhouse (*South Carolina Sta. Bul. 200 (1919), pp. 62*).—This bulletin reports the results of actual and guarantied analysis of 1,297 samples of fertilizers and fertilizing materials collected for inspection in South Carolina during the season 1918–1919. Of the total number of samples, 313 fell below the standard based on the guaranty. Of these, 121 were deficient in ammonia and 58 were deficient in potash.

An act relative to the sale of commercial fertilizers (*Massachusetts Sta. Circ. 32–A (1918), pp. 2*).—The text of the State law relative to the sale of fertilizers is given, amending the original law (E. S. R., 27, p. 327).

AGRICULTURAL BOTANY.

Rate of absorption of soil constituents at successive stages of plant growth, J. S. Burd (*Jour. Agr. Research* [*U. S.*], *18 (1919), No. 2, pp. 51–72, figs. 13*).—In continuation of previous investigations (E. S. R., 38, p. 812), the author reports investigations carried on at the California Experiment Station in which the absorption of soil constituents by barley at different stages of growth is shown. Summarizing the results of his investigation, the author states:

"The absorption of certain soil constituents by barley is characterized by three distinct phases, coextensive with the more important stages of vegetative development. The first of these covers a period of progressively increasing rate of absorption, ending about the time the heads begin to form. At this time the absolute amounts of potassium and nitrogen contained in the plant approach the magnitudes present at complete maturity. The potassium content may even be greater than at maturity. The beginning of the second phase is indicated not merely by a decreased rate of absorption as in maize but by definite and substantial losses of certain constituents (notably potassium and nitrogen and apparently calcium) from the portion of the plant growing above the ground, and presumably from the entire plant. This loss takes place concurrently with the migration of the same constituents into the developing heads. The end of the second phase is characterized by a tendency to absorb again the soil constituents previously lost. This tendency may result in taking up considerable quantities when the plants are very large and well developed . . . The third phase, occurring at the time of ripening of the grain, is marked by a practically complete cessation of absorption of all constituents and an actual loss of most of these.

"The more significant facts brought out here would appear to be: That the two elements with which plant growth in general is most closely associated may approach or exceed their maxima at a comparatively early stage of the plant's development—that is, at the beginning of head formation; that absorption of potassium and nitrogen during the first period of growth is approximately proportional to the growth attained, and in the succeeding periods the final dry-matter content of the crop more than doubles without any very substantial increase in nitrogen content and with an actual loss of potassium; furthermore, that the final dry-matter content of the crop, even when it varies as much in yield as in the cases reported, appears to be nearly proportional to the fresh weight of the crop at the end of the first period. A direct relation is thus traced between the amount of dry matter in the final yield and the amounts of potassium and nitrogen absorbed in the first stage.

"The fact that nitrogen and potassium tend to leave the plant just after the heads begin to form does not prove that their presence is inimical to head formation . . . , but indicates rather that continued absorption at this stage is probably incompatible with normal development."

Relation of the concentration and reaction of the nutrient medium to the growth and absorption of the plant, D. R. HOAGLAND (*Jour. Agr. Research [U. S.], 18 (1919), No. 2, pp. 73–117, figs. 4*).—In a contribution from the California Experiment Station, the author points out the necessity for a study of plant absorption and metabolism as well as what the soil solution contains in investigations on the growth of plants. He gives the results of about four years' research on water extracts of soils held under conditions of exceptional control. The freezing-point method was also used in determining actual osmotic pressures in the soil solution. The studies are said to have shown clearly that the soil solution is never in a state of final equilibrium, but fluctuates daily and seasonally and is profoundly modified as a result of absorption by the plant in such manner that during certain periods the concentration of the soil solution may be reduced to a very low level.

In all the experiments a selected Beldi variety of barley was used as the test plant, and sand and solution culture experiments were carried out under conditions which permitted definite control of the total concentration, composition, and reaction of the nutrient solutions. Marked absorption of all the nutrient elements was found to take place at all periods up to the final stage of growth, when suitable concentrations of the various ions were continuously maintained. This intense absorption during the later stages led to no important increase in yield of crop, the yield being apparently conditioned in large measures on a favorable supply and concentration of nutrients during the first 8 or 10 weeks of the growth cycle.

With increasing concentrations of the nutrient solution it was found in these experiments that the composition, expressed in percentages, and total quantity of nitrogen and potash per plant were decidedly increased in the tops. The same was true of the roots, but in addition these showed a marked increase in the percentage and total quantity per plant of calcium and phosphoric acid. In the tops most of the calcium, magnesium, phosphoric acid, and potash was present in a water soluble form, while in the roots grown in the solutions of the higher concentrations large percentages of insoluble calcium and phosphoric acid were found.

"When plants of uniform development were transferred to nutrient solutions of different concentrations, a greater transpiration took place from solutions of low concentrations. Absorption and transpiration took place independently, so that the solution under the circumstances might become either more or less concentrated, depending upon the original concentration of the solution. The optimum total concentration of the nutrient solution, if defined as the least concentration giving a yield equal to any higher concentration, was not found to be greater than that represented by 0.6 atmosphere osmotic pressure; and it may be less than 0.1 atmosphere. For the solutions used in these experiments, inhibitive concentrations were not higher than those represented by 2 to 2.5 atmospheres osmotic pressure. . . .

"From a consideration of previous experiments it is concluded that there is not sufficient evidence to prove that the plant requires for optimum yield any very specific ratio of ions or elements within wide limits, provided the total supply and concentration of essential elements are adequate."

In conclusion, "it is suggested that the theoretical total osmotic pressure of the nutrient solution is not necessarily significant in its relation to the plant. It is also concluded that the interpretation of results should be based on the composition of the solution in terms of ions or radicals rather than of the salts used in preparing the solution."

The growth of higher plants in soils free of microorganisms, E. B. Fred (*Jour. Gen. Physiol., 1 (1919), No. 6, pp. 623–629, figs. 3*).—Apparatus and manipulation are described, employment of which with sufficient care and under proper conditions is said to insure and maintain during several months complete sterilization of growing plants.

The etching of marble by roots in the presence and absence of bacteria, E. B. Fred and A. R. C. Haas (*Jour. Gen. Physiol., 1 (1919), No. 6, pp. 631–638, figs. 3*).—It having been shown in the paper above noted that germinating legume seeds do not excrete substances in quantities sufficient to exert a toxic action upon the growth of the nodule bacteria of such plants, the authors herein state as a result of studies noted that soil bacteria may play an important part in the nutrition of plants. It is shown also that the presence of bacteria increases the etching effect of the roots on polished marble.

The effect of soy bean germination upon the growth of its nodule-forming bacteria, A. R. C. Haas and E. B. Fred (*Soil Sci., 7 (1919), No. 3, pp. 237–244, figs. 2*).—Investigating the hypothetical toxicity of legume seed during their germination for the nodule bacteria inoculated upon the seed coat, the authors state that it is not permissible to use mercuric chlorid as a sterilizing agent in this connection. In studies upon yellow soy bean germination it was found that the germination of the seed favors the growth of the bacteria. Bacteria-free soy beans were obtained directly from the pods and inoculated with soy bean bacteria, but no toxic action of substances excreted from the germinating seed upon the growth of the nodule bacteria was observed.

Intracellular acidity in Valonia, W. J. Crozier (*Jour. Gen. Physiol., 1 (1919), No. 6, pp. 581–583*).—Results are given of measurements made regarding acidity of the cell sap contained in cells of the marine green alga *Valonia macrophysa*, which are sufficiently large to furnish several cubic centimeters each of fluid from the central vacuole without appreciably altering the composition of the cell sap. This liquid is found to be much more acid than is the surrounding sea water, and to have sensibly the same acidity under all external conditions tested, even when the temperature varied from 18 to 28° C. at different seasons. No effect of darkness on photosynthesis could be detected.

In aquaria, Valonia quickly increases the alkalinity by photosynthetic abstraction of carbon dioxid, but its own internal acidity remains practically constant at a little below pH=6. This finding is held to indicate that in a method of studying photosynthesis the varying external reaction forming the basis of the measurements does not affect materially the internal acidity, the latter being presumably the immediate regulator of respiratory and other protoplasmic processes.

The physiological basis of morphological polarity in regeneration, II, J. Loeb (*Jour. Gen. Physiol., 1 (1919), No. 6, pp. 687–715, figs. 23*).—A review summing up results of reports previously noted (E. S. R., 41, p. 727) notes the fact that the growing region at the apex of a piece of stem cut from a normal plant of *Bryophyllum calycinum* acts in a manner similar to that of a leaf, inhibiting shoot growth in the parts below.

The data herein presented and discussed in considerable detail are thought to show that the leaf influences the formation of roots as well as that of shoots (though strict proportionality is difficult to demonstrate). They also show, the author claims, that the phenomenon of geotropic curvature is also a phenomenon of nutrition and growth, and that Haberlandt's hypothesis of an otolith function of starch granules as the cause of geotropic curvature is neither needed nor warranted. It is thought that the concept of geotropic stimulation should be replaced by that of mass action in this connection.

It is noted that in case of horizontally suspended stems roots grow more rapidly from the lower side, inhibiting such rapid root growth in roots on the upper side. The latter, however, grow rapidly when the lower half of the stem is removed. The same phenomenon is noted in case of roots growing from marginal notches of leaves suspended edgewise; trimming away the notches on the lower edge corresponding to splitting away the lower half of the stem horizontally suspended and causing growth of the roots appearing on the upper margin of the leaf.

Immersion of leaf tips in water accelerates enormously root and shoot formation in the immersed portions, inhibiting correspondingly such growth elsewhere, particularly on the upper leaf margins. Sister leaves suspended in moist air show copious root formation all around leaves vertically suspended, while leaves kept horizontally on edge showed great excess of root growth at the lower margin. Roots and shoots forming on the immersed part of the leaf were allowed later to dry, very soon after which roots and shoots began to appear at the upper margin.

It is claimed that the path for the passage of substance favoring root formation is not identical with that of substances determining shoot formation.

It is stated that each leaf axil of *B. calycinum* has one bud capable of growing a shoot, though normally inhibited by a mechanism which also determines the polar character of regeneration as far as shoot formation is concerned. Roots can develop anywhere on the stem. In the axil a preformed root bud stands just above the preformed shoot bud. Experiments are cited to show that development of roots at the basal end of the stem inhibits that of roots higher up, leaf development higher up inhibiting root formation on this portion.

If the portion of the stem extending basally from the leaf includes one or more nodes, root formation in the stem extending apically from the leaf is usually suppressed, the nodes basally from the leaf acting like basal roots in this respect.

In order to explain the inhibitions observed it is assumed that a more rapidly growing organ in a plant usually inhibits a slow-growing organ in other parts of the plant. This principle is perhaps the one most generally active in the phenomena of correlation.

The more abundant growth of basal roots is assumed to be due to the greater collection of water and solutes appropriate to root growth at the base of a normal stem or isolated part thereof. Root formation is thus primarily a phenomenon of nutrition and growth.

Unavoidable sources of error stand in the way of proving an exact mathematical relation between the increase in the mass of air roots and that of the leaf attached to the same section of stem. Darkened leaves do not increase the mass of roots formed. In round stem sections suspended horizontally the air roots form only on the lower side except at the cut end where they usually appear all around the stem. Roots generally appear earlier than shoots in these experiments. Basal water roots soon cause the disappearance of the air roots higher up.

In a subsequent paper, the author expects to furnish direct proof that the isolation of a piece of plant leads to a change in the flow and distribution of sap, and that this change in the distribution determines the starting of growth in buds previously dormant, which is the essential feature in regeneration.

The connection of oxidases with the improvement of cultivated plants, M. D. ATTI (*Ann. R. Scuola Sup. Agr. Portici, 2. ser., 14 (1916–17), pp. 84*).—The author, having tested the hypothesis announced and reaffirmed by Comes (E. S. R., 22, p. 449; 36, p. 645) that increase of zymotic activity in cultivated plants is associated with increase in the value of the respiratory coefficient, with decrease of the protective organic acids, and with consequent increase in susceptibility to disease, upholds this view, discussing certain implications and deductions.

FIELD CROPS.

Plat competition as a source of error in crop tests, T. A. KIESSELBACH (*Jour. Amer. Soc. Agron., 11 (1919), No. 6, pp. 242–247*).—The author describes investigations made at the Nebraska Experiment Station for the purpose of determining the extent to which plat competition is a factor in crop yield tests. The data presented were secured from rate of planting and variety tests with wheat, oats, and corn. The relative yields of the crops compared in replicated blocks containing five rows for the small grains and three rows for corn were regarded as the true relative values for the particular crops, any differences in yields when crops were grown in single adjacent rows being ascribed to plat competition. In recent tests the outside rows of the blocks were discarded and the true relative yields, practically free from competition, based upon the remaining rows. The small grain plats were replicated 50 times and the corn plats 8 or more times.

It is stated that errors resulting from plat competition appear to be as fully pronounced in many cases as errors resulting from soil and other environmental variations. The general conclusion with regard to comparative yield tests drawn from these investigations is that any test crop should be surrounded by a crop of its own kind, in order to avoid the effect of competition with a dissimilar crop for moisture, nutrients, and possibly light.

The principles brought out in these tests are deemed applicable to any yield test in which dissimilar crops are to be compared. "This may be accomplished for all practical purposes by substituting plats containing three or more rows for single row plats and then discarding from the yield test the outer rows which are subject to competition with the adjoining plats. In case of wide field plats, discarding the outer rows is not so important since the percentage error for the entire plat caused by competition would be much lower. The degree of error resulting from such competition will depend primarily upon the extent to which the crops being tested differ in their vegetative characteristics. The competition will also vary in different seasons."

Experimental error in field trials, T. A. KIESSELBACH (*Jour. Amer. Soc. Agron., 11 (1919), No. 6, pp. 235–241*).—This paper, a contribution from the Nebraska Experiment Station, comprises a reply to a criticism by H. H. Love (E. S. R., 41, p. 635) of a recent publication by the author on the elimination of experimental error in field trials (E. S. R., 39, p. 829).

Relative resistance of various crops to alkali, F. S. HARRIS and D. W. PITTMAN (*Utah Sta. Bul. 168 (1919), pp. 3–23, figs. 70*).—The authors describe studies of the relative germination and early growth in alkali soil of different varieties of oats, wheat, barley, corn, pop corn, millet, beans, and sorghum, and of einkorn, rye, hairy vetch, cowpeas, lentils, alfalfa, sweet, red, alsike, and Egyptian clover, perennial and Italian rye grass, Sudan grass, meadow fescue, timothy, orchard grass, Kentucky blue grass, radish, muskmelon, turnip, onion, kohl-rabi, sugar beets, buckwheat, hemp, flax, and rape. The chlorid, carbonate, and sulphate of sodium were each employed in various concentrations ranging up to 4,000, 8,000, and 12,000 parts per million of dry soil, respectively. The soil (Greenville loam), made up to 20 per cent moisture on a dry basis, was placed in glass tumblers and ten seeds planted in each tumbler. The plants were harvested at the end of three weeks and the dry weight determined. All tests were made in triplicate.

The results secured are presented in the form of graphs which show the relative dry weight of the crop and the number of plants germinated for each salt concentration as compared with untreated checks.

Boswell Winter, Red Rust Proof, Black and White Tartar, and Colorado No. 9 oats in the order named were found to be more nonresistant than the other varieties tested. The growth of oats was stimulated with concentrations up to about 1,000 parts per million of chlorids, 2,000 parts of carbonates, and 3,000 parts of sulphates. Turkey Red Wheat was the most resistant variety tested and Velvet Don the least. Einkorn was slightly less resistant than most of the wheat varieties. Black Hull-less barley was the most resistant and Utah Winter the least resistant of the sorts tested. Rye was among the most resistant crops.

Corn showed toxicity at low concentration, although some crop was produced even at the highest concentration. In comparison with other crops corn appeared to be affected relatively more by chlorids than by carbonates or sulphates.

Millet exhibited about the same resistance as corn. Collier was the most tolerant and milo maize the least tolerant of the sorghums, the latter being the most sensitive plant tested with the exception of some of the grasses. Hairy vetch showed a relatively greater tolerance for chlorids in comparison with other crops.

The growth of alfalfa was retarded by slightly lower concentrations than was that of sweet clover, neither crop showing unusual resistance in the seedling stage. Large seeded plants in general seemed to be capable of better germination in alkali land than small seeded ones.

The growth of beans was stimulated by small quantities of alkali, while it was entirely prohibited at higher concentration. The rye grasses were more tolerant than other sorts, while Kentucky blue grass was the least tolerant of all the crops under investigation and orchard grass only slightly more resistant. Rape showed much greater tolerance for chlorids than for carbonates or sulphates. Sugar beets were stimulated by the lower concentrations of carbonates, but were affected very deleteriously by sulphates and somewhat less by chlorids. Kohl-rabi showed marked resistance for the lower concentrations of sulphates, but was decidedly affected by even the lower concentrations of carbonates.

These results are held to indicate that concentrations of salts added to the soil greater than those employed in these tests are too high to permit a satisfactory yield of ordinary crops. The cereals are deemed to be the best and the grasses the poorest crops for alkali land, while among the forage crops examined, vetch, cowpeas, alfalfa, and sweet clover are regarded as being superior to the grasses. Although timothy and alsike clover are generally regarded as good crops for wet land, they were found to be relatively nonresistant to alkali conditions and are deemed unsuited to wet alkali land.

[Ground water control on permanent meadows as related to quantity and quality of yield], E. F. Simola (*Finska Mosskulturför. Årsbok, 23 (1919), No. 1, pp. 52–109, fig. 1*).—The experiments reported were conducted on meadows laid down on drained bog soil in 1909 with a seed mixture consisting of 50 per cent timothy, 17.5 per cent alsike clover, 7.5 per cent red clover, 12.5 per cent meadow fescue, and 12.5 per cent orchard grass. The ground water on the different series of plats was held at 0.5, 0.75 and 1 meter (39.37 in.) below the surface by means of drainage ditches and dams within them. The plats used in each series were 10, 20, and 30 meters in width. The data are given in detail by years in tabular form.

The average results in hay production for the nine years were in favor of lowering the ground water level to 0.5 meter. Of the different species in the seed mixture timothy in general made the best growth, especially from the third to the seventh year, inclusive. During the last two years the timothy began to decline. The third year of the experiment its growth was favored to some extent by a reduction of the clover through winter injury. The average stand of this grass for the nine years was 83.63 per cent. As compared with the drainage of one meter in depth the stand was greater by 5.39 per cent on the plats drained 0.5 meter deep.

The stand of orchard grass varied from 2.68 per cent the first year to 19.25 per cent the second, with an average of 8.5 per cent for the nine years. Unlike timothy this grass produced the best stand on the plats drained to a depth of one meter, the average difference in stand being 5.16 per cent greater as compared with the depth of 0.5 meter.

Meadow fescue produced a satisfactory stand the first three years, but from that time on it became unimportant and constituted an average of only 3.37 per cent of the total stand for the period of the experiment. The growth of this grass also was favored to a great extent by the deeper drainage.

Red clover the first year gave a stand of about 7.5 per cent, or about the same as the proportion in the seed mixture, but the fourth year it had practically disappeared. The best growth of red clover was made where the land was drained to a depth of 0.5 meter. Alsike clover during the first year of the experiment constituted 11.3 per cent of the stand, which dropped to only 1.46 per cent the second year and to nearly a total decline the third year. It made the best stand on the land with the shallowest drainage. The results did not show that alsike is superior to red clover on lowland soils.

The principal grasses appearing from self-seeding were blue grass, *Poa pratensis*, redtop, tufted hair grass (*Aira cæspitosa*), sheep's fescue, and *Calamagrostis stricta*. The self-seeded grasses reached a minimum of 6.51

per cent of the stand the ninth year, with only 1.14 per cent as an average for the entire period. The stand of weeds, which for the nine years was 0.59 per cent, increased perceptibly during the last two years, and generally also with the depth of drainage and the width of the plats. The more common weeds were *Taraxacum officinale*, *Ranunculus acer*, *R. repens*, *Rumex acetosella*, *R. acetosa*, and *Scutellaria galericulata*.

Chemical analyses of the hay in this experiment indicated a content of 0.52 per cent of lime, 1.15 per cent of potash, 0.29 per cent of phosphoric acid, 1.5 per cent of nitrogen, and 26.73 per cent of fiber.

Report of the division of agronomy and plant breeding, H. B. Cowgill (*Ann. Rpt. Insular Expt. Sta., Dept. Agr. and Labor, Porto Rico, 1918, pp. 78–95, 98–104*).—This describes the progress of sugar-cane breeding projects and of fertilizer experiments with sugar cane conducted at the station for the year ended June 30, 1918, in continuation of similar work previously noted (E. S. R., 39, p. 33). Observations on the types and variations in the tobacco grown on the island are also noted.

In the cross-pollination work 15 successful crosses were made from which 1,794 seedlings were secured. Otaheite and Crystallina were again used as seed parents, while the pollinators included B–4,596, B–347, B–3,412, D–117, D–109, and P. R. 207. The viability of the seed of most of the varieties was relatively low, both when cross- and open-pollinated. Tassels of Crystallina and D–117 bagged for self-pollination failed to produce any viable seed. Tassels of D–109 and D–117 which were bagged with tassels of Crystallina for the cross-pollination of the latter also produced no germinable seed. Seedlings produced by cross-pollination in 1916 and planted in separate lots according to parentage are briefly described and the degree of resemblance to the parent varieties indicated.

Selections were made from the 1912, 1913, 1914, and 1917 seedlings for propagation and further selection. Brief descriptions are given of the ten most promising selections from the 1913 and 1914 seedlings, which are now regarded as new varieties. Certain varieties isolated from the 1912 seedlings were grown both in the field and as cultivated plant cane, the most promising sorts being P. R. 209, P. R. 219, P. R. 260, P. R. 271, and P. R. 292.

Tests of foreign seedling cane varieties to determine the degree of resistance to the new cane disease have failed to reveal any immune varieties. Comparative variety tests made at Central Coloso resulted in yields ranging from 18 tons of cane per cuerda (about 0.98 acre) for D–109 to 34.9 tons for B–4,596, as compared with about 26 tons for Rayada and 21.2 tons for Crystallina. Similar tests conducted at Central Cambalache resulted in yields ranging from 137.5 quintals (about 14.9 tons) per cuerda for B–347 to 455 quintals for D–117, as compared with an average of 296 quintals for Rayada. A lot of 1,500 first-generation seedlings was transferred in bamboo pots to a disease-infected field at Central Coloso for the purpose of selecting disease-resistant strains, but the entire lot became so heavily infected that it was plowed up before maturity.

In fertilizer experiments conducted at the station the highest average yield, 22.81 tons of cane per acre, for the seasons of 1914–15 to 1917–18, inclusive, was secured from an application of a fertilizer containing two parts of phosphorus to one part each of nitrogen and potassium. Cooperative fertilizer tests conducted at Central Coloso resulted in a maximum average yield of 18.64 tons of cane per acre for the limed and unlimed series from an application of 60 lbs. each of NH_3 and P_2O_5, and 30 lbs. of K_2O. It is stated that the results of these and earlier experiments made on similar soil indicate that potash is not an essential ingredient in commercial fertilizer for this soil, while phosphoric acid is also of little value. Sulphate of ammonia is deemed a very good form of commercial nitrogen for use on sugar-cane soils. Based on the estimated cost of the various fertilizer treatments entering into the experiment, it is concluded that the increase in yield following the use of large quantities of fertilizer was not sufficient to pay their cost.

[Field crop production in Cuba], M. CALVINO (*Estac. Expt. Agron. [Cuba], Informe 1917–18, pp. 57–181, 226–296, 308–330, 334–383, 428–431, 433–436, figs. 118*).—Rather detailed information is given relative to the production of cereals, beans, root crops, leguminous and nonleguminous forage plants, peanuts, fiber plants, sugar cane, and tobacco in Cuba.

[Report of agronomy work at the Guam Station, 1918], G. BRIGGS (*Guam Sta. Rpt. 1918, pp. 29–36, 38–42, 43, 44, pls. 4*).—This describes the continuation of work with field crops along the same general lines as previously noted (E. S. R., 40, p. 327).

A comparison of different ratoon crops of Kafir corn and sorghum showed that the stalks gradually lost in height and circumference except for the last crop, which was produced during the least rain. In a test of grain sorghum varieties for forage the best results were secured with white milo maize and Darso, which produced 10.32 and 10.5 tons of forage per acre, respectively. Darso and Schrock Kafir are said to have produced the best quality forage. Both side branches and suckers were produced on certain crops in early plantings, while later plantings were entirely free from them. The grain sorghums were seriously troubled with insect pests and failed to mature seed in plantings made on new ground. Black Amber and so-called Red Amber sweet sorghum produced 8.75 and 13.65 tons of forage per acre, respectively. Sudan grass sown in drills produced four cuttings during the year with yields of green forage amounting to 9.83, 4.18, 2.13, and 3.37 tons per acre for the first, second, third, and fourth cutting, respectively. A fifth cutting made 89 days later produced 7.8 tons. The lowest yields were secured during the wet season.

All varieties of cotton were pruned back to a distance of 15 in. and a ratoon crop secured ranging in yield from 152.7 lbs. of seed cotton per acre for Arizona-Egyptian to 599.1 lbs. for Guam-Egyptian. Hartsville and Covington-Toole, upland types, produced 540.9 and 468.8 lbs. per acre, respectively. Practically all Hawaiian-Egyptian plants were killed by the pruning. Guam-Egyptain is said to be strictly an upland variety and not an Egyptian type.

The rice crop was an entire failure, due to insect attack.

Velvet beans, cowpeas, mung beans, and soy beans have been successfully employed as green manure crops. Velvet beans have been the most effective of the cover crops tested for keeping down weeds, preventing erosion, and for permanency. Whippoorwill cowpeas proved superior to Blackeye. Velvet beans planted on corn ground with the vines supported on stakes produced 21.6 bu. of seed per acre the first picking, as compared with 9.54 bu. from vines allowed to run on the ground. Determination of the shelling percentage of a number of cover crops gave the following average results: Cowpeas 69.2 per cent, mung beans 54.7, velvet beans 56.25, soy beans 60, jack beans 54.8, pigeon peas 62.5, and a garden variety of string pole beans 66.2 per cent.

Observations on the effect of shade and fertilizers on tobacco and on the control of insect enemies of the crop have been continued for three years, and are believed to justify the following conclusions: Shading tobacco with coconut leaves did not prove beneficial, but reduced yields, although the number of first-class leaves was increased to some extent during the long, dry periods. Commercial fertilizers increased the total yield of tobacco 11.58 per cent, but have not increased the percentage of marketable leaf. The use of lead arsenate spray and fertilizers on the same plats resulted in the highest yield and quality of tobacco leaves. Imported improved varieties of tobacco made a better showing the first year than did the native sorts the last two years.

[Report of field crops work in Uganda, 1918], S. Simpson and A. R. Morgan (*Ann. Rpt. Dept. Agr. Uganda, 1918, pp. 6–10, 13, 25–28, 30, 31*).—This report contains information relative to the production of cotton, sugar cane, rice, corn, and wheat in the Protectorate, together with the results of field tests with cotton, rice, tobacco, and wheat at different experimental centers.

[The production of oleaginous plants in the French colonial possessions], F. de Roux et al. (*Cong. Agr. Colon. [Paris], 1918, Compt. Rend. Trav., vol. 2, pp. 639, figs. 6*).—Detailed information is given relative to the production and exploitation of peanuts, castor bean, sesame, cotton seed, karite (*Butyrospermum parkii*), palm (*Elæis guineënsis*), coconut, olive, and miscellaneous plants in French Africa, Madagascar, the East Indies, and Indo-China. Mention is also made of oleaginous plants produced in the Belgian Kongo and of the cotton-seed oil industry in the United States.

Growing alfalfa in western Kansas, C. R. Weeks (*Kansas Sta. Circ. 73 (1919), pp. 10, figs. 4*).—This describes cultural methods and field practices employed in growing the crop. Measures for the prevention of injury to alfalfa from grasshoppers and rodents are also noted.

Cross-fertilization in alfalfa, L. R. Waldron (*Jour. Amer. Soc. Agron., 11 (1919), No. 6, pp. 259–266*).—Preliminary experiments conducted at the North Dakota Experiment Station are described which were planned to secure data on the amount of cross-fertilization occurring between *Medicago sativa* and *M. falcata*. Flowering records indicated that 7.48 per cent of the F_1 progeny of *M. sativa* parentage were hybrid in character, as compared with 42.7 per cent from *M. falcata*. It is thought that the disparity was due principally to the comparative scarcity of both flowers and pollen in *M. falcata*. A slight but rather significant negative correlation was found to exist between the amount of seed produced in the parent plants and the extent of cross pollination.

A factor analysis of barley, II, G. von Ubisch (*Ztschr. Induktive Abstam. u. Vererbungslehre, 21 (1919), No. 2, pp. 65–117, figs. 19*).—This supplements work previously noted (E. S. R., 41, p. 639), embracing observations on the behavior of additional character in barley crosses, including the brittleness of the rachis, length of the haulm, adherence and nonadherence of the glumes to the epicarp, color of the glume, and nature of the basal bristles, together with notes on the correlation between haulm length and length of grain and density of spike. The gametic composition of 16 sorts of barley with respect to the characters studied is presented in tabular form.

The author concludes that on the whole, three splitting types of barley can be distinguished as follows: (1) The ordinary type in which *n* factor pairs give rise to an *n*-hybrid division, to which belong the row factor *Zz* splitting into 3 two-rowed individuals: 1 six-rowed individual, and the factor pair for toothing, *GgG'g'*, which splits in the ratio of 15 toothed: 1 not toothed individual; (2) the type in which two genes must come together in order that a character may be expressed to which belong the factor pairs for brittleness *BbRr*, grain length, *UuVv*, in the absence of *a*, and the hood factor *K* which gives rise to hoodedness only in the presence of *A'*; and (3) the type in which the relationship remains in the ratio of 3:1 even when a large number of factors are involved, indicating the presence of a single dominant factor. The density of the spike, grain length, and length of haulm were all found to be included in the third type.

Mariout barley, with a discussion of barley culture in California, G. W. Hendry (*California Sta. Bul. 312 (1919), pp. 57–109, figs. 19*).—This bulletin comprises a description and comparison with other varieites of Mariout barley, said to possess remarkable drought resistant properties and to have been extensively grown by the Romans in Egypt. Cultural methods and field practices employed in growing the crop in California are also described. Characters possessed by Mariout barley which are deemed superior to those of common barley include greater drought resistance, better results from spring planting, more economical use of soil moisture, less shattering, earlier ripening, better quality of hay, a higher percentage of grain by weight, and a higher average yield for a period of nine years at University Farm. Mariout is not so well adapted to cool mountainous districts, and does not withstand winter-flooding so well as common barley. It is said to equal the latter in malting value.

Biennial cropping with barley has been found more profitable than annual cropping when the annual precipitation is less than 16 in., while annual cropping is deemed best with a rainfall of more than 18 in. The use of the combined harvester is said to be limited to regions of low humidity and where rain does not occur during the harvest season. The average loss through shattering from its use amounted to about 13 bu. per acre. This loss can be eliminated by the use of the self-binder. It is estimated that under pre-war conditions it cost $22.79 to produce and sell an acre of barley using the combined harvester system and $26.13 using the self-binder, while the gross per acre values of the average crops produced under the two systems amounted to $26.95 and $33.13, respectively. The average net saving per acre from the use of the self-binder was estimated to be $2.84.

The hulled and hulless barley of the ancient Egyptians, A. Schulz (*Ber. Deut. Bot. Gesell., 34 (1916), No. 8, pp. 607–619, pl. 1*).—The author reviews the evidence relative to the nomenclature of barley among the ancients, and concludes that the Egyptians had one or more definite terms to distinguish the naked form from the hulled type.

Climatic adaptations of the white tepary bean, G. W. Hendry (*Jour. Amer. Soc. Agron., 11 (1919), No. 6, pp. 247–252, pl. 1*).—This paper, a contribution from the California Experiment Station, deals with the relation of the white tepary bean (*Phaseolus acutifolius* var. *latifolius*) to its climatic environment, with particular reference to its reaction to the cool coast climates of central and northern California.

On the basis of observations made at several experimental centers in the State, it is concluded that in the cool climates of the central and northern California coast districts tepary beans develop abnormally. The white tepary is more prolific than varieties of *P. vulgaris* in the semiarid interior districts, but less prolific in the central and northern subhumid coast districts. It is stated that the preblossoming, blossoming, and life periods are each functions of climate, being longer in cool than in warm climates, and being either increased or diminished as the planting date causes them to occur during cool or warm weather.

Two systems of corn breeding, A. N. Hume (*South Dakota Sta. Bul. 184 (1919), pp. 70–87*).—This bulletin describes experimental work begun in 1912 in which observations were made on the system of corn breeding employed at the Illinois Experiment Station (E. S. R., 17, p. 26) whereby the separate rows were planted with seed from separate mother ears, all the stalks of the even-numbered rows detasseled, and the seed ears selected from the highest yielding even-numbered rows as compared with a system of simple ear-row selection without detasseling.

The average yield for the highest yielding rows in the Illinois system was 32.2 bu. per acre and for the lowest yielding rows 28.6 bu., with a general average of 40.5 bu. In the second system the highest-yielding rows produced on the average 52.4 bu. and the lowest 26.5 bu., with a general average of 39.7 bu. Check rows planted with bulk seed of the same variety as the single-ear selections produced on the average 37.3 bu.

During 1913, 1914, and 1915 a direct comparison was made between seed selected from the highest yielding rows of the detasseled plat, seed from remnants of the highest yielding mother ears selected from plats with no detasseled rows, and seed from mass selected ears in order to determine their relative yielding ability. Average yields were secured amounting to 40.7, 41.6, and 40.9 bu. per acre, respectively, indicating a slight superiority for seed from remnants of high yielding ears. A possible "leveling" effect of cross-pollination is pointed out which it is held may tend to obscure differences in the yielding ability of seed from the different sources indicated.

The author concludes that for practical purposes corn breeding is "a process of seeking out the highest yielding 'mother' ears, usually by planting the same in ear rows, and of later planting the remnants of these ears and the progeny thereof under such conditions that they will dominate production."

Steps for conducting a corn breeding plat along these lines are suggested for South Dakota conditions.

The relation of certain ear characters to yield in corn, H. H. Biggar (*Jour. Amer. Soc. Agron., 11 (1919), No. 6, pp. 230–234*).—This paper, a contribution from the Bureau of Plant Industry, U. S. Department of Agriculture, reports the results of observations on the relation between yield and length and weight of ear, number of rows of kernels, and shelling percentage in five varieties of corn grown at five different points.

It is stated that there appeared to be no special relation between yield and the number of rows and shelling percentage. The length and weight of ears showed positive correlations with yield, but they were not consistently large. The character of length appeared to be somewhat significant for some of the varieties. It is concluded that, "the results would, on the whole, indicate that there is no well-marked basis for using ear characters to indicate yield possibilities."

Inheritance of fasciation in the maize spike, G. Lo Priore (*Staz. Sper. Agr. Ital., 51 (1918), No. 9–12, pp. 415–430*).—This comprises a general review of the work of other investigators, together with that done at the agricultural experiment station of Modena (Italy). A bibliography of 26 titles is appended. See also a previous note (E. S. R., 41, p. 640).

Cotton culture in Peru, V. Marie (*El Cultivo del Algodon en el Peru. Lima, Peru: Imp., Bol. Cien., Arts., e Indus., 1918, pp. 69*).—This comprises a general account of the industry in Peru.

Regulations of the Secretary of Agriculture under the United States Warehouse Act of August 11, 1916, as amended July 24, 1919.—Revised regulations for cotton warehouses (*U. S. Dept. Agr., Off. Sec. Circ. 143 (1919), pp. 41*).—Revised rules and regulations for cotton warehouses (E. S. R., 38, p. 895) promulgated September 15, 1919, are presented. The amended text of the act is included.

Natural cross-pollination in milo, R. E. Karper and A. B. Conner (*Jour. Amer. Soc. Agron., 11 (1919), No. 6, pp. 257–259*).—Preliminary observations made during 1917 and 1918 at the Texas Experiment Station are held to indicate that an average of 6 per cent natural cross-fertilization occurred in white milo maize plants which had been mechanically introduced into a plat of yellow milo maize. It is thought, however, that where a pure strain is grown in the vicinity of another field which might contaminate it the amount of crossing in the outer rows would not exceed 3 per cent.

The distribution of dry matter and nitrogen in the potato tuber.—Variety, King Edward, M. D. Glynne and V. G. Jackson (*Jour. Agr. Sci. [England], 9 (1919), No. 3, pp. 237–258, figs. 13*).—The authors describe investigations made at the Rothamsted Experimental Station during 1918 on the distribution of dry matter and nitrogen in different parts of the potato tuber, suggested by studies of the best method of sampling potatoes. The data are presented in tabular form and fully discussed. The results secured have been summarized as follows:

"The percentage of dry matter in the potato tuber is lowest in the skin and increases to the inner cortical layer, the zone containing the greater part of the vascular system, and decreases toward the center of the tuber. In each zone the proportion of dry matter is higher toward the umbilical than the terminal end of the tuber. The percentage of nitrogen in the fresh material tends to decrease from the skin to the inner cortical layer and to increase in the medullary zone. Thus it increases from zone to zone in the opposite direction to the dry matter. Nitrogen tends to increase with dry matter from the terminal to the umbilical end. Microscopical examination shows the starch grains densest in the region of the vascular system, and decreasing toward the center and surface of the tuber. A high degree of correlation is found between the specific gravity and percentage dry matter of whole tubers. For purposes of sampling the method of taking two radially opposed sectors, or two diagonally opposed eighths, was far more accurate than the coring method."

Marketing Nebraska potatoes, J. O. Rankin (*Nebraska Sta. Circ. 9 (1919), pp. 3–32, figs. 16*).—This comprises a general discussion of the subject from the standpoint of the commercial grower including information on the best time and method of marketing the crop, the proper loading of cars, inspection and grading, collecting and billing, care in transit, and United States Railway regulations governing the handling of perishable freight.

Storage of potatoes, O. Butler (*New Hampshire Sta. Circ. 20 (1919), pp. 8, figs. 2*).—The author discusses briefly the effect of temperature, aeration, and humidity upon stored potatoes, and the storage of potatoes in cellars and pits, both for seed and for domestic use.

Report of the German Potato Culture Station, 1918, C. von Eckenbrecher (*Ztschr. Spiritusindus., 1919, Ergänzh., pp. 65*).—This comprises a detailed report of the experimental work conducted by this station with 20 varieties of potatoes at 37 outlying experimental fields, situated in 15 Provinces. Variety tests with early, medium, and late sorts, conducted at Kloster Hadmersleben by F. Heine, are also noted.

Notes on the cultivation of ragi (Eleusine coracana), F. G. Spring and J. N. Milsum (*Agr. Bul. Fed. Malay States, 7 (1919), No. 3, pp. 154–161*).—The production of the crop in the Federated Malay States is described.

The after-ripening and germination of rice harvested at different stages of development, M. Kondō (*Ber. Ōhara Inst. Landw. Forsch., 1 (1918), No. 3, pp. 361–387*).—The author describes observations on the viability and vigor of rice of different degrees of maturity, both immediately after harvest and after storage. The rice was harvested at intervals in its growth designated as the milk, the yellow ripe, the fully ripe, and the dead ripe stages.

Seed harvested in the milk stage and germinated immediately was found to be viable but to lack in vigor. Storage for about 15 days after preliminary drying or for a month without drying resulted in quite satisfactory germination. The germination of the yellow ripe grain was also markedly improved after from one to three months' storage. Fully ripened grain germinated quite well immediately after harvest, but showed greater viability a month later. Dead ripe grain germinated very readily immediately after harvest and was not materially benefited by storage. Grain stored in a dry condition completed the ripening process much more rapidly than that stored without preliminary drying, but the latter showed greater viability and vigor. The storage of unripe grain in the panicle was found to be detrimental, in many cases, to after-ripening. Drying in the sun increased the viability of freshly harvested grain, especially in the case of that harvested in the milk and yellow ripe stages. Diffused sunlight had no effect upon the viability of fully ripened grain, but exerted a favorable influence upon immature seed. The greater the degree of maturity and the further advanced the ripening process and the drying of the grain the more rapid and uniform was the germination and the greater was the viability and vigor of the seed. Many seeds harvested in the milk stage failed to develop the plumule, while in seeds harvested at the other stages of development the radicle was often lacking.

Sorghums for silage and hay, R. L. STEWART (*New Mexico Sta. Bul. 119 (1919), pp. 20, figs. 3*).—The production of sorghum for forage in New Mexico chiefly as a dry-land crop, is described, including reports by county agents. In variety tests with both grain and sweet sorghums, yields of silage were secured ranging from 2.83 tons per acre for Sudan durra to 14.64 tons for Japanese or Honey sweet sorghums, while the latter produced more than 21 tons per acre at the station in 1918. It is stated that the crop is valuable both as a silage crop and as a second or catch crop for the warmer irrigated valleys of the State.

Sugar cane culture in Porto Rico, F. S. EARLE (*Insular Expt. Sta., Dept. Agr. and Labor, Porto Rico, Circ. 17 (1919), Spanish Ed., pp. 3–24, figs. 11*).—This comprises a rather popular account of the cultural methods and field practices employed in growing the crop in the island.

Establishing Kanred wheat in Kansas, S. C. SALMON (*Kansas Sta. Circ. 74 (1919), pp. 16, figs. 8*).—This comprises an account of the history, characteristics, adaptations, and performance of Kanred winter wheat developed by the station, together with suggestions to Kansas wheat growers as to how the new variety may be best substituted for those sorts now grown in the State, and reports from growers.

The naked wheats of the ancient Egyptians, A. SCHULZ (*Ber. Deut. Bot. Gesell., 34 (1916), No. 8, pp. 601–607, figs. 3*).—Briefly reviewing the literature dealing with remnants of naked wheat found in Egypt thought to have come down from the ancients, the author concludes that the number of such remnants is not large, and that at present the evidence is insufficient to properly classify them.

Important factors in the cost of producing wheat, A. BOSS (*Jour. Farm Econ., 1 (1919), No. 3, pp. 85–88, fig. 1*).—Labor, land, seed, machinery, and other general costs of producing wheat in Minnesota, as shown in a bulletin by Peck, previously noted (E. S. R., 41, p. 91), are briefly reviewed.

The work of the committee on seed stocks, R. A. OAKLEY (*Jour. Amer. Soc. Agron., 11 (1919), No. 6, pp. 221–229*).—This paper, a contribution from the Bureau of Plant Industry of the U. S. Department of Agriculture, describes the activities of the committee appointed by the Secretary of Agriculture to look after the supply of and demand for seeds during the war.

Seed Reporter (*U. S. Dept. Agr., Seed Rptr., 3 (1919), No. 4, pp. 12*).—The principal features of this, the final issue of this publication, include information relative to the millet seed outlook; a summary of vegetable and field seed stocks, receipts, sales, exports, and imports; estimated seed requirements and sources of supply of corn, beans, small grains, peanuts, potatoes, grain sorghums, cowpeas, soy beans, and cotton; and articles on Some of the Services Rendered by Field Seedsmen, by G. C. Edler, and on Seed Wheat and Seed Oat Situation in the Northern Great Plains, by C. W. Warburton. Statistical data are also presented on imports of clover seed; estimated amount of field pea, millet, and forage sorghum seed secured from different sources; movement and quality of clover and grass seed; imports of forage plant seeds permitted entry into the United States; timothy, clover, alfalfa, and Kentucky blue grass seed prices; and exports of clover and timothy seed. Information relative to stocks of Italian red clover and alfalfa seed, stocks and prices of Maine seed potatoes, Canadian standards for seed grain, importations of seed wheat and seed oats from Canada, and vegetable seed crops in California is briefly noted.

HORTICULTURE.

[Report of the horticulturist], G. Briggs (*Guam Sta. Rpt. 1918, pp. 45–53, 54–59, pl. 1*).—A progress report on cultural experiments with fruits, vegetables, coconuts, bananas, and coffee, including notes on plant acquisitions, seed and plant distribution, and the results of a survey of the coconut and copra industry in Guam.

Among the results noted for the year it was demonstrated that lemons can readily be propagated from cuttings, thereby simplifying the perpetuation and increase of desirable strains. Satisfactory results were obtained in the plant house in grafting young female papaya shoots upon young papaya plants. Although no field tests have been conducted as yet, this method appears promising for the elimination of unnecessary male plants from papaya orchards. Only a few male plants are needed for pollinating purposes, whereas the percentage of males resulting from a seedling orchard is frequently large.

The roselle (*Hibiscus sabdariffa*), the calices of which are valuable for making sauce, jelly, and wine, as well as *Alberia gardneri*, a small tree native of India, the small black fruits of which are useful for making jelly and sauce, have been successfully grown at the station. The roselle has met with favor on the island and is being propagated for distribution. It is pointed out that the leaves also of this plant may be used for making jelly or for greens, being prepared like spinach. The Smooth Cayenne pineapple introduced by the station has proved far superior to the native variety, and the area devoted to this crop over the island has been largely increased.

In a small fertilizer test, ammonium sulphate gave superior results in promoting the growth of pineapple plants. Bone meal was second best. No difference was noticeable between sodium nitrate, acid phosphate, or barnyard manure plats, but they were all superior to the check plat. Chicken manure more than doubled the yield of papaya trees when applied once a month at the rate per tree of 6.5 lbs. when wet or 3 lbs. when dry. Manuring improved the quality of papayas to a marked extent. The unfertilized Madagascar variety yielded nearly twice as much as the unfertilized Hawaiian variety, but there was only a slight difference in yield between the two varieties under fertilization. The Madagascar variety was superior in quality, with thicker flesh and a smaller seed cavity. In a cooperative fertilizer test on coconut trees the two plats receiving ammonium sulphate and acid phosphate are doing better than any of the others. A plat receiving clean cultivation and a plat receiving lime are making good growth. All of the fertilizer plats are superior to the check.

The most noticeable progress in garden work at the station was the development of a superior strain of tomato and work in the control of powdery and downy mildew on muskmelon, cucumber, squash, and pumpkin vines. Of the several sprays tested, only sulphur in frequent applications seemed to control the disease. The plants responded quickly to the treatment and produced excellent fruits.

As a result of the coconut survey among the principal growers some information was secured, and is here presented, relative to the number of nuts required to make 100 lbs. of dry copra, average number of nuts per tree, bearing age of trees, yield per acre, time required to sun-dry copra, shinkage in drying copra, percentage of coconut oil, kinds of nuts making the best copra, kinds of nuts on the island, methods of growing seedlings, planting distances, and cost of producing copra.

Electroculture in horticulture, H. Blin (*Jardin, 33* (*1919*), *Nos. 718, pp. 339–342, figs. 4; 719, pp. 347–350, figs. 4*).—Investigations conducted in various countries dealing with the forcing of horticultural plants by electrical stimulus are here reviewed.

Blooming time of Iowa plants, 1918, C. M. King, G. J. Ringland, and M. Hemenway (*Trans. Iowa Hort. Soc., 53* (*1918*), *pp. 226–231*).—Blooming dates are given for a large number of Iowa trees, shrubs, and perennial plants.

Vegetable growing, G. Truffaut (*Production des Légumes. Versailles: Libr. Lab. et Étab. Georges Truffaut* [*1918*], *pp. 260, figs. 129*).—A treatise on vegetable growing, prepared with special reference to its use in the development of army gardens, but also dealing with the culture of vegetables in the home garden.

[Report on tomato and melon breeding], H. B. Cowgill (*Ann. Rpt. Insular Expt. Sta., Dept. Agr. and Labor, Porto Rico, 1918, pp. 96–98*).—Notes are given on character transmission in the F_2 generation of a cross of cherry tomato upon the Livingston Globe variety. No plant occurred with fruit sufficiently large to make it more desirable to cultivate than existing varieties, but many of the plants were very promising as to vigor of growth. prolificacy, and disease-resistance.

First generation F_1 plants of two melon crosses were grown. The varieties crossed were a locally cultivated oblong melon of the soft rind type as the pistillate parent and two varieties belonging to the hard rind, or winter melon type (Hybrid Casaba and Honey Dew), as staminate parents. The plants produced from the crosses appeared very resistant, and no fungicide was used upon them at any time. A different type of melon was produced by each cross. With Casaba as the staminate parent the hybrid was pyroform, grooved, and more or less rough-skinned. With Honey Dew as the staminate parent the hybrid was a smooth-skinned short-oval melon, either only faintly grooved or without grooves. The hybrid plants were more precocious and more prolific than the local melon, which is always a shy bearer. The breeding work is to be continued.

Temperature in relation to quality of sweet corn, N. E. Stevens and C. H. Higgins (*Jour. Agr. Research* [*U. S.*], *17* (*1919*), *No. 6, pp. 275–284, fig. 1*).—A review of recent literature on the subject, including data on experiments conducted in 1918 by the Bureau of Plant Industry, U. S. Department of Agriculture. A list of cited literature is given.

Analytic studies of Golden Bantam corn made at Lewiston, Me., during 1918 showed rapid loss in sugars in stored corn. The rate at which the sugar was lost increases with rise of temperature at least up to 20° C. (68° F.). The rate of respiration increases with higher temperatures at least up to 30° C. These results confirm the conclusions of Appleman and Arthur resulting from similar storage studies with Stowell Evergreen corn (E. S. R., 41, p. 646).

Observations made in both Maryland and Maine indicate that the temperature of green corn on the stalk while in the shade is usually near that of the air, while in the sun it often is above that of the air. The authors made a comparative study of the daily temperatures during the corn-picking season in Maryland and in Maine, the 1918 temperatures at Baltimore, Md., during August and at Portland, Me., during September being selected as representative for the picking season in each State. The corn-picking season (August) in Maryland had a much higher average temperature, 74.6° F., than the corresponding season (September) in Maine, 59.5°, and the authors conclude that, the original quality and the methods of handling being equal, corn handled at the lower temperature must inevitably be the superior.

The limit of germination in seeds of Lepidium sativum, P. Lesage (*Trav. Sci. Univ. Rennes, 14 (1916), No. 1–2, pp. 31–36*).—In some experiments conducted by the author in 1915 garden cress seed showed considerable viability even at the age of seven years. The seed germinated much better between blotting paper, however, than when germinated either in moss, earth, or water, and it is concluded that the limit of viability is about reached at the above age. Storing seed in absolute alcohol appeared to stimulate germination somewhat as compared with storing it in paper bags in free air. The author was of the opinion, however, that further tests should be conducted before drawing any conclusions as to the stimulating effect of alcohol.

Varieties of fruit, D. C. Mooring (*Okla. Agr. Col., Ext. Div. Circ. 107 (1919), pp. 4*).—A descriptive variety list of orchard and small fruits recommended for the home orchard in Oklahoma.

New or noteworthy fruits, U. P. Hedrick (*Jour. Internatl. Gard. Club, 3 (1919), No. 3, pp. 380–389, pl. 1*).—A contribution from the New York State Experiment Station, in which the author calls attention to the hardy fruit testing work of the station and describes some of the new or noteworthy varieties of orchard and small fruits tested.

Is thinning fruit profitable? W. H. Alderman (*Hoosier Hort., 1 (1919), No. 6, pp. 1–10*).—A summarized account of thinning experiments with apples conducted at the West Virginia Experiment Station for several years is given.

Thinning had a marked effect upon the size of the fruit. In some cases size was increased to such an extent that it made thinning profitable by increasing the amount of marketable stock. Thinning the fruit 3 or 4 in. apart had very little effect as compared with check trees. Thinning the fruit 9 to 10 in. apart increased the size of fruit considerably, but reduced the total crop. Generally speaking, thinning fruit 6 to 7 in. apart gave the best results.

Improvement of quality through thinning was confined principally to improvement in color, except that the thinning operation tended to reduce the number of defective apples.

There was a distinct effect on the young trees in the shape or form of the tree. This effect appears to be due primarily to the fact that the crop is more evenly distributed than the unthinned crop, consequently fewer limbs are broken and bent.

The net returns from thinning over a period of several years have varied from actual loss to 100 per cent gain. Generally speaking, it pays to thin when the trees are bearing heavily and are not in the most vigorous condition.

In these experiments the effect of thinning was confined to the current season's crop. In no case was any effect produced on the next year's crop.

Preparation of barreled apples for market, W. M. Scott, H. C. Hetzel, H. W. Samson, and M. Stockton (*U. S. Dept. Agr., Farmers' Bul. 1080 (1919), pp. 40, figs. 24*).—This describes in detail methods employed successfully in representative orchards throughout the country in harvesting, grading and packing, hauling, and loading barreled apples, including details of packing-house arrangement and equipment.

Pear harvesting and storage investigations in the Rogue River Valley.—Second report, C. I. Lewis, A. E. Murneek, and C. C. Cate (*Oregon Sta. Bul. 162 (1919), pp. 5–39, figs. 12*).—A progress report on investigations begun in 1917 (E. S. R., 39, p. 844), giving some of the more important results obtained during the season of 1918.

A statistical study was made of the increase in size of Bartlett pears in the Rogue River Valley during the growing season of 1918. The results, as here tabulated and further illustrated by a number of diagrams, show that the fruit of this variety increases gradually in size and the volume of fruit increases at an accelerated rate throughout the season, independent of climatic or cultural conditions. Linear enlargement in transverse diameter is proportionally faster than the longitudinal enlargement. It is suggested that seeds probably have an influence upon the form of pears. No important change in the average length and diameter of the stem of fruits was noted.

A storage test having proved to be of little value as an index to proper time of picking, a new "pressure test" to measure the maturity of pears at the time of picking was given a preliminary trial. This test consisted essentially in pressing a steel ball half embedded in a block of hard wood against the side of the fruit and registering the pressure necessary to puncture the fruit by a spring scale. A distinct correlation appeared to exist between the degree of maturity of pears and resistance to pressure of tissues of the cortex and epidermal regions. This resistance, and hence the condition of maturity, was measured at intervals of 3 to 4 days. In the case of Bartletts, an average gradual lowering in resistance of half a pound in each 24 hours was recorded, similar areas of pressure being used throughout the season. Tests taken 6 hours after picking were found to be more reliable than those taken approximately 24 hours later. This is attributed to a change in ripeness in fruit after picking. No correlation was established between transverse diameters of the specimens used on the same date and resistance to pressure. Pressure tests of Bosc pears gave similar results, though of a less indicative character, the Bosc being a much slower ripening pear with coarse epidermis.

The season's storage tests with Bartlett pears showed that size of fruit was not a factor in ripening and decay. Pears picked during the middle or latter part of the season keep slightly longer in cold storage than those picked early. Early picked fruit is decidedly inferior in quality to that harvested on later dates. Relatively high temperature with a high percentage of humidity prevented the best ripening of early picked Bartletts. Within the limits of a temperature conducive to ripening, no difference in rate of maturing of stored Bartletts was noted when a change in temperature of 10 to 15° F. was registered, provided the same approximate percentage of humidity was maintained. A strikingly good keeping and eating quality was exhibited by lots picked extremely late in the season. It is suggested that this may be due to tardiness in maturing of fruit kept late on the trees because of the prevailing high temperatures during the midseason.

With reference to the storage of Bosc pears, it appears that when they are kept beyond the normal limits of the life of this variety consideration should be given to an ascending gradient of moisture content correlated with a descending gradient of temperature of the commonly used storages. Of 12 methods of storage used, common storage, car-temperature storage, and delay of 14 days followed by car temperature for 12 to 15 days followed by cold storage were found to be the best. A delay of at least two weeks seems to be essential for Bosc put in cold storage. The higher the humidity, the less time would be required before storage. Both relatively high temperature with low humidity and low temperature with high humidity were harmful to the proper ripening of Bosc.

Plum pollination, A. H. HENDRICKSON (*California Sta. Bul. 310* (*1919*), *pp. 3-28, figs. 5*).—Plum pollination experiments were conducted with several varieties of plums at the University Farm and in the Santa Clara Valley during the five seasons 1914–1918. The methods of pollinating are described, and the results are presented in tabular form and fully discussed. A list is given of literature cited.

Of the Japanese plums the varieties Combination, Kelsey, Satsuma, Burbank, Wickson, Sultan, and Abundance were found to be self-sterile; Climax was apparently self-fertile. The European varieties Clyman, Tragedy, and probably Grand Duke were self-sterile, while Yellow Egg and Pond, judging from one year's data, appeared to be self-fertile. The French and Sugar prunes are self-fertile, whereas the Imperial and Robe de Sergeant prunes were practically self-sterile. No evidence of inter-sterility among plums or prunes was found.

With respect to varieties suitable as pollenizers, the early blooming Japanese varieties were scanty pollen producers and not effective pollenizers, while the later blooming varieties produced pollen abundantly and are effective pollenizers. All of the five European varieties tested seemed to be abundant pollen producers and to cross-pollinate one another effectively. The Sugar, Imperial, and French prunes cross-pollinated one another effectively. The Robe de Sergeant prune cross-pollinated readily with Sugar and French, but was not tested with Imperial.

Further observations on trees where there was an abundance of bees flying and trees where bees were scarce emphasized the desirability of having bees in the orchard (E. S. R., 38, p. 747). Although no definite conclusions are thus far drawn, it appears probable that climatic factors are important in the setting of plums and prunes.

The "yema" graft of the vine, L. O. BONNET (*Mo. Bul. Dept. Agr. Cal.*, *8* (*1919*), *No. 9, pp. 505–508, figs. 5*).—A contribution from the University of California, in which the author describes a process of budding or single-eye grafting that originated in the vineyards in the south of Spain and has since been used with greatest success in Australia.

As compared with budding, which is performed on herbaceous shoots and above ground, the yema graft is performed on nearly mature wood and below ground. A single eye is used as in budding, but a segment of wood is cut out with the eye and inserted into the stock. Very high percentages of successful grafts have been secured with this method, which is best performed in the latter part of August and during September.

Grapes and how to grow them, J. LANSDELL, edited by T. W. SANDERS (*London: W. H. & L. Collingridge, 1919, 3. ed., pp. 114, pls. 15, figs. 37*).—A small handbook dealing with the history, culture, management, propagation, and insect and fungus enemies of the grapevine in vineries, greenhouses, or the open air.

Developing new grape industries, G. C. HUSMANN (*Cal. Fruit News*, *60* (*1919*), *No. 1635, pp. 3, 7*).—A brief review of some of the viticultural investigations of the U. S. Department of Agriculture, with special reference to cultural experiments with the Panariti currant grape (E. S. R., 38, p. 346) and the Ohanez table grape (E. S. R., 39, p. 242).

The results thus far secured with the Panariti variety give promise that the dried currant industry can be successfully developed in California. It is believed that the American-grown Ohanez grape, packed in *Sequoia sempervirens* sawdust, should supplant importations of this variety from the Almeria district of Spain.

How about the cherimoya? W. Popenoe (*Cal. Citrogr., 3* (*1918*), *No. 5, pp. 102, 116, fig. 1*).—Observations made on the cherimoya (*Annona cherimola*) in Guatemala led the author to conclude that this fruit is sufficiently hardy to be grown profitably in California. It is suggested that the failure of many cherimoya trees planted in California to fruit may be due to an inherent difference in the productiveness of seedling cherimoyas, as certain trees in southern California have habitually produced fruit. Lack of pollination and proper pruning are also suggested as limiting factors in fruit production. In lieu of definite knowledge as to the real cause of scanty fruit production, the author advocates the use of budwood from trees known to be productive.

Report of the division of chemistry, F. López Domínguez (*Ann. Rpt. Insular Expt. Sta., Dept. Agr. and Labor, Porto Rico, 1918, pp. 105–108*).—A continuation of previous work (E. S. R., 39, p. 49). Data are given for three different varieties of grapefruit, showing the chemical changes taking place during the ripening process.

The varieties Marsh Seedless and Duncan did not reach the standard ratio of seven of sugar to one of acid in sufficient proportions for exportation, until about the middle of November, while the Triumph variety showed the ratio in every instance from the first sample picked in September. In all three varieties the percentage of solids in solution in the juice increased as the season advanced, and this increase continued gradually even after a ratio of seven was reached. Almost all of the acid was formed in the fruit during the first stages of development, although in some cases acid was elaborated in small proportions even after the fruit had reached maturity. The acid percentage decreased as the fruit developed and matured, although not to the same extent in all varieties. The total sugar content increased continually until maturity was reached, then remained practically constant. The ratio between invert sugar and sucrose remained constant until maturity was reached and then the ratio began to increase. The only suggestive change in the composition of juice after the fruit was picked was the inversion of the sucrose.

Sweating the fruit did not introduce any appreciable change in the composition of the juice, except in the case of immature fruits. The most striking effect of sweating was the acceleration in the inversion of the sucrose, the acid content remaining constant. The percentage of juice in the fruit increased until maturity was reached, and then it remained practically constant. It ranged from 32.71 per cent for the Triumph variety to 46.63 per cent for the Marsh Seedless variety. The percentage of skin, as well as the thickness of the skin, decreased as the fruit matured, then remained constant. Very little difference between varieties in their content of skin was noted. The ratio of solids to acids increased slightly in one of the lots after being picked and remained constant in two other lots.

Manurial experiments with limes (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Dominica, 1918–19, pp. 24–27*).—Yield data are given showing results of manurial experiments with limes, conducted during the two seasons 1917–18 and 1918–19. Yield data for the same two seasons are given for plats of spineless and common limes budded on sour orange stocks and for common seedling limes.

No definite conclusions are thus far drawn from the manurial experiments. They indicate, however, that lime cultivation can be established on coast lands in Dominica within six years, and more than average returns obtained. The results of budding experiments show clearly the tendency to early bearing which is characteristic of budded and grafted plants.

[Cocoa, palm products, and fruits in Gold Coast], W. S. D. Tudhope et al. (*Govt. Gold Coast, Rpt. Agr. Dept., 1918, pp. 11–14, 16, 18, 20, 21, 24, 25, 26–28, 29, 30, 31, 32, 38, 39, 40, 43, 44, 45, 46, 47, 49, 50, 54, 55, 57, 58, 60, 61, 62, 63, 64*).—Notes on the present status of the cocoa, palm oil, cola, and coconut industries in Gold Coast, including the results of cultural tests at the various agricultural stations and substations.

History and development of French walnuts in Oregon, H. E. Dosch (*Bien. Rpt. Bd. Hort. Oreg., 15 (1917–18), pp. 121–129, fig. 1*).—A brief account of the development and present status of the Persian walnut industry in Oregon, including cultural and variety notes.

Methodical nomenclature of official and drug yielding plants based upon official medical codes from various parts of the world, L. Bruntz and M. Jaloux (*Plantes Officinales et Plantes a Drogues Médicamenteuses. Paris: Vigot Bros., 1918, pp. LXVI+260*).—Under each plant is given the scientific and common name, the portion of the plant used, and the countries from which it is reported.

Perfume and aromatic plants, A. Rolet (*Plantes a Parfums et Plantes Aromatiques. Paris: J. B. Baillière & Sons, 1918, pp. 432, figs. 103*).—This is one of the series of volumes comprising the Encyclopédic Agricole, edited by G. Wery. The present work deals with plants yielding perfumes and aromatic plants from all parts of the world. The various plants are described, and information is given relative to varieties, distribution, culture, methods of harvesting, and uses.

The gladiolus, K. R. Boynton (*Jour. Hort. Soc. N. Y., 2 (1919), No. 22, pp. 323–333*).—Brief notes on the botany, history, development, and culture of the gladiolus, including a descriptive list of the most desirable varieties as tested at the New York Botanical Garden.

Tulip droppers, A. B. Stout (*Jour. Internatl. Gard. Club, 3 (1919), No. 3, pp. 463–472, figs. 21*).—The author describes and illustrates the method by which a tulip plant frequently burrows downward in the soil and buries its main bulb to a depth of several inches, and also describes some fine droppers which were observed at the New York Botanical Garden. A bibliography relating to droppers is appended.

The making of a flower garden, I. D. Bennett (*New York: Frederick A. Stokes Co., 1919, pp. VII+244, pls. 15, figs. 4*).—A popular treatise on flower gardening, including several planting plans and planting tables.

Flower growing, G. Roda (*Manuali di Floricoltura. Milan: Ulrico Hoepli, 1919, 7. ed., rev. and enl., pp. VIII+288, figs. 128*).—A small manual on the culture of ornamentals, including general principles and specific notes relative to the culture and uses of the more important flowers and ornamental foliage plants.

FORESTRY.

Manual of forestry, A. Romiti (*Manuale per il Forestale. Casale Monferrato, Italy: Marescalchi Bros., 1917, pp. XV+133, figs. 4*).—A small manual prepared for Italian foresters, containing special information relative to the importance and distribution of the tree species in Italy, the planting and care of forests, cultural operations, management systems, yield tables, and a monthly working calendar.

Forestry.—I, Silviculture, E. Marsden (*Ann. Rpt. Bd. Sci. Advice India, 1917–18, pp. 42–44*).—Brief statements of progress made in statistical work with Indian forest trees (E. S. R., 38, p. 144), cultural studies with tan-yielding trees, afforestation, and the development of silviculture systems. Conclusions based on continuous observations during eight years relative to the method of working bamboos are given. See also a previous note (E. S. R., 39, p. 246).

Forestry.—II, Economic forest products, R. S. Pearson (*Ann. Rpt. Bd. Sci. Advice India, 1917–18, pp. 45–49*).—Brief statements of progress made in work dealing with paper pulp materials, the antiseptic treatment of timber, the physical and mechanical properties and seasoning powers of various timbers, uses of different woods, and destructive distillation for charcoal and tar.

Forest products: Their manufacture and use, N. C. Brown (*New York: John Wiley & Sons, 1919, pp. XIX+471, pl. 1, figs. 120*).—This work presents the chief commercial features in the production, manufacture, and utilization of the most important forest products other than lumber in the United States.

The tree book, I. N. McTee (*New York: Frederick A. Stokes Co., 1919, pp. XII+[3]+234, pls. 15*).—Part 1 of this popular work deals with the life history of trees. Part 2 describes the common American species and acclimated foreign species ordinarily met with in garden and forest. Part 3 contains a general account of the forester and his work, with special reference to the occupation of the forester in the Forest Service of the U. S. Department of Agriculture.

Woods called cedar, W. H. Lamb (*Amer. Lumberman, No. 2296 (1919), pp. 58–60*).—A list of 65 species from various countries, classed as cedar, is given. The data given include common and scientific names, distribution, and brief remarks on the tree and its uses.

The culture and exploitation of oil palms, E. de Wildeman (*Matières Grasses, 12 (1919), No. 137, pp. 5197–5201*).—A brief review of the present status of the oil palm industry in various tropical countries, including a reference list of cited literature.

Rubber, Y. Henry (In *Matières Premières Africaines. Paris: Émile Larose, 1918, vol. 1, pp. 1–67, pls. 8, figs. 3*).—A survey of the wild and plantation rubber industries in West Africa, in which the author points out under what conditions wild rubber can compete with plantation rubber and gives considerable information relative to the present status of the plantation rubber industry in the European colonies in the west coast of Africa. He concludes that wild rubber can compete with plantation rubber only under well organized systems of exploitation and management, and that the Hevea rubber tree, under plantation conditions, has proved much more remunerative than Funtumia rubber.

Experiment carried out to determine the contraction across the grain which takes place in teak (Tectona grandis), while seasoning, R. S. Pearson (*Indian Forester, 45 (1919), No. 9, pp. 462–464, pl. 1*).—Data are given on an experiment undertaken to determine the amount of contraction which takes place in teak timber when passing from a green to an air-dried state, and also to ascertain what effect an increase or decrease of humidity in the air has upon the timber after reaching an air-dried condition. The experiment shows, in brief, that even after teak has reached an air-dried state it continues to be affected by climatic conditions, and generally requires about eight years to maintain a constant shape.

The returned soldier and forest jobs, R. Zon (*Canad. Forestry Jour., 15 (1919), No. 10, pp. 399–402, figs. 2*).—In this article the author points out that the transient life of timber areas under ordinary exploitation creates transient towns and homeless workers. He advocates the organization of our National

Forests into small units on a strictly continuous yield basis, thereby providing conditions for permanent forest communities.

The forest wealth of Mexico, M. A. DE QUEVEDO (*Bol. Soc. Mex. Geogr. y Estadis., 5. ser., 8 (1919), No. 2, pp. 281–298, pls. 4*).—A survey of Mexico's resources in lumber and other forest products, and a plea for adequate forest protection in the interest of national development.

Eighth annual report of the State forester to the governor for the year ending December 31, 1918, F. A. ELLIOTT (*Ann. Rpt. State Forester Oreg., 8 (1918), pp. 22, fig. 1*).—Chiefly a review of fire losses for the season, and fire protective work.

Annual reports of the State forester to the State Board of Forest Commissioners for the period ending November 30, 1917, and November 30, 1918, F. E. PAPE (*Ann. Rpts. Wash. State Forester, 1917–18, pp. 31, pls. 5*).—This report deals primarily with fire protective work during the 1917 and 1918 seasons, including recommendations and suggestions for improving the service.

A review of the net revenues from the Saxony State forests for the year 1915, WAPLER (*Tharand. Forstl. Jahrb., 68 (1917), No. 3, pp. 149–161*).—The usual statistical review for the year 1915, relative to the yield in lumber and minor forest products, receipts, expenditures, and net returns from the State forests in the various districts of Saxony.

Annual report of the forest department for the year ending March 31, 1918, including report on railway sleeper plantations for the same period, C. E. LEGAT (*Union So. Africa, Ann. Rpt. Forest Dept., 1917–18, pp. IV+43*).—A report similar to the above for the administration and management of the State forests in the Union of South Africa.

Annual report of the woods and forest department for the year ended December 31, 1917, C. E. LANE-POOLE (*Ann. Rpt. Woods and Forests Dept. [West. Aust.], 1917, pp. 24*).—A report of the administration and management of the State forests in Western Australia for the year 1917, including statistical data relative to yields in major and minor forest products, revenues, expenditures, etc.

Report of the woods and forests department for the half year ended June 30, 1918, C. E. LANE-POOLE (*Ann. Rpt. Woods and Forests Dept. [West. Aust.], 1917, pp. 17*).—A report similar to the above for the half year ended June 30, 1918.

DISEASES OF PLANTS.

Plant prophylaxis, A. N. MARTINEZ (*Quinta Norm. Estac. Expt. [Ambato, Ecuador], Circ. 10 (1918), pp. 14*).—This is a general account of measures available for protection of plants against nematodes, diseases, and other adverse influences, such as weather.

The dissemination of parasitic fungi (*Indian Tea Assoc., Sci. Dept. Quart. Jour. No. 4 (1917), pp. 125–135; No. 1 (1918), pp. 15–21*).—These two sections are made up mainly of a series of extracts from an article previously noted (E. S. R., 38, p. 349).

Rusts in southern France, G. ARNAUD (*Bul. Soc. Path. Veg. France, 4 (1917), No. 2, p. 95*).—In fungus infested material sent from a point in the Maritime Alps, the author found on branches of *Olea europæa* attacked by black scale (*Lecanium oleæ*) perithecia of *Capnodium meridionale*, also known to attack other plants. Branches of fig (*Ficus carica*) severely attacked by *Ceroplastes rusci* showed numerous perithecia of *Ceratocarpia cactorum*, which was also present on branches and leaves of *Citrus aurantium* in connection with two other scale insects.

The forms of Peronospora parasitica, E. GÄUMANN (*Bot. Centbl., Beihefte, 35 (1918), 1. Abt., No. 3, pp. 395–533, figs. 46*).—This is a contribution to the study of the species question in parasitic fungi, dealing more particularly with *P. parasitica*, for which a long list of hosts is given.

Puccinia petasiti-pulchellæ n. sp., W. LÜDI (*Centbl. Bakt.* [*etc.*], *2. Abt., 48 (1917), No. 1–4, pp. 76–88, figs. 2*).—The author describes a new species under the name *P. petasiti-pulchellæ*, a fungus said to be parasitic on several plants among the Swiss Alps.

The genus Synchytrium, W. RYTZ (*Bot. Centbl., Beihefte, 34 (1917), 2. Abt., No. 3, pp. 343–372, pls. 3*).—This is chiefly a study of *S. taraxaci* with reference to related species, as *S. endobioticum* (*Chrysophlyetis endobiotica*).

Report of the Division of plant pathology and botany, J. A. STEVENSON (*Ann. Rpt. Insular Expt. Sta., Dept. Agr. and Labor, Porto Rico, 1918, pp. 130–144*).—A summary report is given of the work carried on by the plant pathologist and botanist during the year of the report, the most pressing problem under investigation having been that of the mottling disease of sugar cane. Notes on minor diseases are given based on the work of R. C. Rose, former assistant of the department. Among the fungus diseases the following new species are described: *Cercospora sechii and Helminthosporium sechiicolum* on chayote (*Sechium edule*), *Cercospora pisa-sativæ* on peas, and *Sclerotium griseum* on sugar cane.

Some diseases of cultivated plants at Para, Brazil, F. VINCENS (*Bul. Soc. Path. Veg. France, 5 (1918), No. 1, pp. 45–55, figs. 5*).—The diseases here briefly noted include a tobacco leaf scorch (*Cercospora nicotianæ*); a rice leaf spot (*C. orzyæ*); a sugar cane leaf spot (*C. kopkei*); a branch disease (*Lasiodiplodia theobromæ* n. sp.) and a witch broom of cacao; a disease of young fruits (*Glœosporium theobromicolum* n. sp.) and one (*Phyllosticta theobromicola*) in the crotches of the limbs of cacao; and a leaf disease of *Anacardium occidentale* (*Dendrodochium parænse* n. sp.) The new species are briefly discussed.

Work on plant diseases at the Royal Botanic Gardens, Kew [1918] (*Jour. Bd. Agr.* [*London*], *26 (1919), No. 2, pp. 174–178*).—The plant disease survey recently instituted is said to give a more accurate and detailed knowledge than has ever before been obtained regarding the incidence of plant diseases in Great Britain.

Notes are given regarding the occurrence and importance of wheat yellow rust (*Puccinia glumarum*), black currant rust (*Cronartium ribicola*), tomato damping off (*Phytophthora cryptogea*), leaf blotch of cucumber (*Colletotrichum oligochætum*), and onion smut (*Urocystis cepulæ*). Investigations are reported as relating to some other plant diseases.

Mycology [Mysore, India, 1916–17], L. C. COLEMAN (*Rpt. Agr. Dept. Mysore, 1916–17, pp. 22–24*).—The work of the mycological section has been confined mainly to the study of diseases of areca nut, mango (mildew), coffee (root rot, leaf disease, and black rot), spike disease of sandal, and smut of jola.

Mildew of lily and a cotyledon disease of maple, G. ARNAUD (*Bul. Soc. Path. Veg. France, 5 (1918), No. 1, pp. 58–60*).—The author discusses the presence, on lily, of *Phytophthora syringæ* and of *Botrytis cinerea;* and on maple cotyledons, of *Cercosporella acerina.*

Failure of seedlings, particularly of crucifers, P. KYROPOULOS (*Centbl. Bakt.* [*etc.*], *2. Abt., 45 (1916), No. 6–12, pp. 244–257, pls. 3*).—Fungi named as found in causal connection with failures of cruciferous seedlings include *Pythium debarayanum, Sclerotinia sclerotiorum, S. fuckeliana, Botrytis cinerea, Phoma betæ, Olpidium brassicæ,* and *Moniliopsis aderholdii.*

[Control of cruciferous club root], L. Hiltner and C. Korff (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 14 (1916), No. 3, pp. 25–28*).—Steiner's method for control of club root is discussed. The application is said to be composed of a mixture, in determinate proportions, of quick lime with inert matter. This is spread over the soil to the depth of 10 cm. (4 in.)

Review of experimentation in the Netherlands looking to the control of cereal and grass smuts and stripe disease, H. M. Quanjer and J. O. Botjes (*Ztschr. Pflanzenkrank., 25 (1915), No. 8, pp. 450–460, figs. 2*).—This includes a tabulation and discussion of experimentation on control of grain diseases ranging from 1902 to 1914.

Seed treatment for the prevention of cereal smuts, W. W. Mackie (*California Sta. Circ. 214 (1919), pp. 8*).—This comprises a brief popular account, prepared in cooperation with the Office of Cereal Investigation, U. S. Department of Agriculture, of the cereal smuts in California, together with directions for seed treatment with both copper sulphate and formaldehyde.

The different susceptibilities of wheat varieties to stinking smut, O. von Kirchner (*Ztschr. Pflanzenkrank., 26 (1916), No. 1, pp. 17–25*).—The author found that the two German wheat varieties tested gave approximately the same somewhat high degree of acidity. This fact points to a connection between such acidity and the resistance of these varieties to stinking smut (*Tilletia tritici.*)

The nematode disease of wheat in Virginia, F. D. Fromme (*Virginia Sta. Bul. 222 (1919), pp. 3–12, figs. 5*).—A description is given of the nematode disease of wheat due to *Tylenchus tritici*, which is said to occur in 33 counties in the State. The disease is reported most prevalent and destructive in the northern part of the Valley and Piedmont sections, and the heaviest losses seem to have resulted from the practice of growing wheat two or three years in succession.

The effect of the parasite on the wheat blade is described, and it is said that the disease may be recognized by the wrinkling and distortion of the leaves of the young wheat plants, the abnormal appearance of the heads, and by the occurrence of hard, brown galls in the heads in place of the grains of wheat. Tests were made of various control methods, and it was found that a mechanical removal of the galls was sufficient to insure freedom from infection, since the water and salt brine were as effective as the chemical or temperature treatments. Spraying the grain with formaldehyde solution did not prevent infection. It is claimed that the disease can be controlled by the use of clean seed and crop rotation.

A wilting disease of cucumber, T. Lindfors (*K. Landtbr. Akad. Handl. och Tidskr., 56 (1917), No. 7–8, pp. 627–636, figs. 3*).—A study of a wilting disease of cucumber is described. The causal organism is said to be *Verticillium alboatrum.*

Onion smut: A disease new to Britain, A. D. Cotton (*Jour. Bd. Agr. [London], 26 (1919), No. 2, pp. 168–174, pl. 1*).—The author gives a history of outbreaks of onion smut (*Urocystis cepulæ*) in Great Britain, with an account of the disease itself as regards symptoms, the spread and vitality of the spores, and control measures, emphasizing prevention.

Investigations on the mosaic disease of the Irish potato, E. S. Schultz, D. Folsom, F. M. Hildebrandt, and L. A. Hawkins (*Jour. Agr. Research [U. S.], 17 (1919), No. 6, pp. 247–273, pls. 8*).—The results are given of a cooperative investigation, carried on between the Bureau of Plant Industry, United States Department of Agriculture, and the Maine Experiment Station, which throws some lights on the means of transmission of the mosaic disease of the potato.

This disease is said to be widely distributed throughout the United States and it has a decidedly detrimental effect on the Irish potato.

Characteristic symptoms are produced upon the aerial parts of the plant, especially on the foliage, but these symptoms may be modified or obscured by differences in environment or variety. It apparently tends to increase the sugar content of the leaves and to reduce their starch content.

The disease may be transmitted through the use of diseased tubers, through the grafting of healthy scions upon diseased stock, or diseased scions upon healthy stock, and by transferring juice from a diseased plant to a healthy plant. At least two species of aphids were found capable of transmitting the potato mosaic, whether the aphids were transferred artificially or dispersed naturally.

Hill selection has not proved successful for maintaining healthy stock when practiced in fields having a considerable number of mosaic plants. Roguing or eliminating mosaic plants before aphids become abundant is indicated indirectly as being helpful, and has been actually efficient for checking the spread of the disease.

Potato-spraying experiments at Wye College, 1918, E. S. Salmon and H. Wormald (*Jour. Bd. Agr. [London], 26 (1919), No. 3, pp. 269–278, pls. 2, fig. 1*).—This is a report giving tabular details of experiments to test the efficacy of Burgundy mixture applied two or three times, and of a new mixture containing copper in which sodium carbonate was replaced by sodium silicate to make what is called a sodium silicate Bordeaux mixture. The powder strawsonite and regular Bordeaux mixture were also used.

It was found that the Burgundy mixture containing copper sulphate and sodium carbonate in the ratio of 1:1.25 may cause in the variety Great Scot a severe scorching of the haulm. The same was true of the sodium silicate mixture, though ordinary Bordeaux mixture produced no injury. The best results were obtained on plats sprayed three times with 1.4 per cent Bordeaux mixture.

Sweet-potato diseases, L. L. Harter (*U. S. Dept. Agr., Farmers' Bul. 1059 (1919), pp. 24, figs. 15*).—This is a revised edition of Farmers' Bulletin 714, which has been previously noted (E. S. R., 35, p. 49).

Tomato rot and control measures, S. C. Bruner (*Rev. Agr., Com., y Trab. [Cuba], 1 (1918), No. 6, pp. 300–303, figs. 2*).—This is a report on an investigation regarding rots of exported tomatoes. The most important parasites encountered were *Cladosporium fulvum*, *Alternaria solani*, and *Septoria lycopersici*, though others are named as being present.

July treatment for chlorosis in fruit trees, J. Vercier (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 40 (1919), No. 27, pp. 9, 10*).—This is a discussion of the method and possibilities of treating chlorotic fruit trees with iron sulphate, which is recommended for the latter half of July.

Silver-leaf in fruit trees (*Jour. Bd. Agr. [London], 26 (1919), No. 2, pp. 162–168, pls. 2*).—This is a descriptive account of silver-leaf disease of fruit trees, mainly as studied by Brooks (E. S. R., 38, p. 50), and as supposedly due in most cases at least to *Stereum purpureum*.

The susceptibility to Gymnosporangium of interspecial members of the pome fruits, G. Sahli (*Centbl. Bakt. [etc.], 2. Abt., 45 (1916), No. 6–12, pp. 264–301*).—Results are tabulated, with discussion, of a large number of tests with hybrids, chimeras, and other intermediate forms of pomaceous fruits in relation to attack by Gymnosporangium.

Water core and bitter pit of apple, D. Bois (*Bul. Soc. Path. Veg. France, 5 (1918), No. 1, pp. 34–41*).—This is chiefly a bibliographical discussion of bitter pit and water core of apple.

Witches' brooms on Pyrus communis, E. Lemée (*Bul. Soc. Path. Veg. France, 5 (1918), No. 1, pp. 32, 33*).—A witch broom on *P. communis* is described as presumably due to a fungus, the classification of which is as yet undetermined.

[Permeability as related to osmotic phenomena in diseased plants], K. Heusser (*Vrtljschr. Naturf Gesell. Zürich, 62 (1917), No. 3–4, pp. 565–589, figs. 3*).—This is a study of osmotic properties, at different stages, of plant cells in galled or distorted portions of leaves of peach or plum attacked by *Exoascus deformans*.

Anaheim, or California [vine] disease, A. Pachano (*Quinta Norm. Estac. Expt. [Ambato, Ecuador], Circ. 11 (1918), pp. 8*).—This is a compact summary of known facts and opinion regarding the characters, causative relations, and management of the so-called California disease of grape.

Grape disease, R. Averna-Saccá (*Bol. Agr. [Sao Paulo], 19. ser., No. 3 (1918), pp. 214–220, figs. 3*).—Two forms of grape anthracnose are attributed, respectively, to *Glœosporium ampelophagum* and *G. physalosporæ*.

A new method of defense against Oïdium, R. de Mas Solanes (*Rev. Asoc. Rural Uruguay, 48 (1919), No. 1, pp. 50–52*).—Sulphuric acid in aqueous solution is said to be efficacious against Oïdium; also against other grape diseases and insect enemies.

Grape diseases in Cuba, S. C. Bruner (*Rev. Agr., Com., y Trab. [Cuba], 1 (1918), No. 8, pp. 406–409, figs. 5*).—This report mentions among the more important fungi causing grape diseases in Cuba, *Plasmopora viticola*, *Uncinula necator* (*Erisyphe tuckeri*, *Oïdium tuckeri*), *Guignardia bidwellii*, *Glœosporium ampelophagum*, *Cercoscopora viticola*, and *Uredo vitis*.

The banana disease in tropical America, J. R. Johnston (*Hacienda, 12 (1916), No. 3, pp. 87–89, figs. 3*).—The author gives a further account (E. S. R., 34, p. 847), with investigations by himself as well as studies by others, on the Panama disease of banana, which is said to cause enormous loss in Cuba and in other countries ranging from Brazil to the United States.

Susceptible varieties are named. Apparently the Fusarium causing the disease is not the same in case of all the varieties attacked. Further study of the various strains is considered as desirable.

Control measures tried have so far had little or no success. The fungus may be spread in various ways. Sterilization of implements, plant sanitation, and quarantine are indicated as offering the only practical control measures at present available.

The banana and its diseases, J. R. Johnston (*Rev. Agr., Com., y Trab. [Cuba], 1 (1918), No. 8, pp. 419–421, figs. 4*).—In this account of drawbacks to the culture of the banana (*Musa paradisiaca* and *M. sapientum*) in Cuba, the author discusses briefly the Panama disease (noted also above) attributed (at least in some localities and varieties) to *Fusarium cubense;* root disease (*Marasmius stenophyllus*); heart rot (not epidemic); fruit rot (*Glœosporium musarum* and *Diplodia cacaoicola*), and petiole rot (causation undetermined).

A disease of cacao, A. N. Martínez (*Quinta Norm. Estac. Expt. [Ambato, Ecuador], Circ. 6 (1916), pp. 13*).—A descriptive discussion is given of the disease of cacao attributed to a Phytophthora (*P. cactorum?*). Measures against this are at present limited to prevention, but in connection therewith Bordeaux mixture is recommended.

[Some coconut diseases] G. Briggs (*Guam Sta. Rpt. 1918, p. 54*).—Brief notes are given of a root disease of coconuts, the cause of which is unknown. Little leaf or dwarfing was found associated with unfavorable physical conditions surrounding the trees. A leaf disease which is probably due to *Pestalozzia palmarum* was also found to be present.

[Coconut diseases], P. J. Wester (*Philippine Agr. Rev., 11 (1918), No. 1, pp. 45–47, pl. 1*).—Bud rot of coconut, attributed to fungi in India, is said to be due to bacteria in the Philippines. The disease was first reported in 1907. Measures other than prevention are ineffective.

Notes are given regarding the effects of some diseases in the Philippines as compared with the effects in other regions.

Black rot disease of tea [India] (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 3 (1917), pp. 80–84*).—A disease of tea similar to that occurring in Ceylon has been observed in damp situations in portions of northeast India. The fungus, though classed as *Hypochnus theæ*, is said to differ in details from the Ceylon species. The young leaves are blackened. The more tender ones become soft and rotten, but are prevented from falling by the thin mycelial film which connects the leaf stalk to the branch. The fungus is thought to appear on any part above ground, but to do no damage to old stems. The extent of leaf attack depends, apparently, upon the weather. The fungus penetrates the leaf only from the underside. The presence of the fine threads can be distinguished with difficulty by the unaided eye. Apparently the disease spreads very rapidly in favorable weather (saturated atmosphere and high temperature).

The mode of occurrence (in spots) of the disease suggests spore dispersal, though this has not been demonstrated. The fungus was found to be alive on the prunings two months after their removal. Bordeaux mixture is recommended as a spray for the bushes after pruning away the diseased branches.

An outbreak of black rot in Upper Assam, A. C. Tunstall (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 3 (1918), pp. 70–72*).—The disease of tea noted above is reported to have been observed in July, 1918, in two or three gardens in Upper Assam. It is distinguished from gray blight of local occurrence by the adherence of affected leaves and the absence of the black dots characteristic of gray blight. The black rot organism is said to be wholly external. The spread of the fungus appears to have been from bush to bush by the processes incident to ordinary work in the gardens and by the workmen passing from section to section.

Careful removal of diseased or dead branches and shoots and application of lime sulphur checked the disease, which is thought to be due to *Hypochnus theæ* or a closely related species.

Failure of flower bulbs, P. Sorauer (*Ztschr. Pflanzenkrank., 26 (1916), No. 1, pp. 26–37, fig. 1*).—Failure of bulbs of hyacinth and tulip to sprout in early spring, due to disease conditions observed, is said to be an example of the after effects of conditions rather than one of direct causation by bacteria and fungi, which are present in the later stages only. The relation of external and internal conditions to the trouble are discussed.

Rusts of important Swiss coniferous forest trees, E. Fischer (*Schweiz. Ztschr. Forstw., 69 (1918), No. 6–7, pp. 113–120*).—This is an account covering some years' investigation in regard to diseases of fir, larch, and pine in Swiss forests.

Pear rust and Juniperus sabina, E. Lemée (*Bul. Soc. Path. Veg. France, 4 (1917), No. 2, pp. 96, 97*).—It is stated that near Alençon, in the neighborhood of sabine Juniper (*J. sabina*) carrying *Gymnosporangium sabinæ*, *Ræstelia cancellata* had appeared in greater or lesser abundance, the spores being transported over considerable distances by insects.

Diseases and enemies of Picea omorica, A. Geschwind (*Naturw. Ztschr. Forst u Landw., 16 (1918), No. 11–12, pp. 387–395*).—Fungi named as injurious include *Herpotrichia nigra*, *Lophodermium macrosporum*, and *Trametes pini*.

Needle necrosis of pine, F. Vincens (*Bul. Soc. Path. Veg. France, 5 (1918), No. 1, pp. 27–31, figs. 3*).—A shriveling of the distal portions of pine needles was investigated, and *Pestalozzia truncata* was isolated from the diseased portions. The derived material failed to inoculate, but this may have been due, it is thought, to lack of normal conditions.

The relation of Peridermium pini to Cronartium, C. VON TUBEUF (*Naturw. Ztschr. Forst u. Landw., 15 (1917), No. 7–9, pp. 268–307, figs. 6*).—The author, reporting in part on a continuation of studies previously noted (E. S. R., 34, p. 750), states that he has obtained direct infection of *Pinus strobus* with *C. ribicola.*

Continuation of studies previously noted indicate only partial control of *P. pini* by employment of its parasite *Tuberculina maxima.*

A note on the canker on Albizzia spp., A. C. TUNSTALL (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 1 (1918), pp. 13, 14, pl. 1*).—Much damage is said to be done to *Albizzia* spp. by a fungus (*Polyporus* sp.) which attacks at wounds, causing a wood rot and producing its white hard brackets ranging in size from 3 or 4 to 6 in. across. Dalbergia, being more resistant, is suggested as a replant in badly infested areas.

The parasitism of Ustulina vulgaris, M. PATOUILLARD (*Bul. Soc. Path. Veg. France, 4 (1917), No. 2, p. 100*).—It is stated that *U. vulgaris* has been shown to attack lindens at the surface of the ground, covering the trunk for 20 to 30 cm. (7.8 to 11.8 in.), penetrating to the central portions, and killing the tree by what appears to be parasitic activity.

A walnut tree disease, J. CAPUS and J. FEYTAUD (*Bul. Soc. Path. Veg. France, 5 (1918), No. 1, pp. 61–63*).—A disease of walnut trees attributed to *Armillaria mellea* has been taken under further investigation.

A disease of walnut, E. PARAVICINI (*Schweiz. Ztschr. Forstw., 70 (1919), No. 1–2, pp. 15–17*).—This is a brief descriptive account of *Favolus europæus,* which is said to be comparatively rare north of the Alps, though widely distributed in France. This fungus is said to gain access to the walnut tree by way of injuries, being frequently found in association with other fungi.

Wood infection studies with spores of dry rot, C. WEHMER (*Ber. Deut. Bot. Gesell., 34 (1916), No. 2, pp. 82–87, figs. 2*).—Spores of Merulius sown thickly on different kinds of wood gave no indication of germination.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Laws relating to fur-bearing animals, 1919, G. A. LAWYER, F. L. EARNSHAW, and N. DEARBORN (*U. S. Dept. Agr., Farmers' Bul. 1079 (1919), pp. 31*).—A summary of the laws in the United States, Canada, and Newfoundland relating to trapping, open seasons, propagation, and bounties.

The birds of Desecheo Island, P. R., A. WETMORE (*Auk, 35 (1918), No. 3, pp. 333–340*).

Sixth biennial report of the Kansas Entomological Commission for the years 1917–18, J. C. MOHLER ET AL. (*Bien. Rpt. Kans. Ent. Comm., 6 (1917–18), pp. 67, figs. 2*).—This contains reports of G. A. Dean (pp. 5–11) and S. J. Hunter (pp. 12–19), State entomologists, and J. H. Merrill (pp. 20, 21), State apiarist, and papers on Beekeeping on the Farm, by J. H. Merrill (pp. 22–37), and The Life History of the Honeybee, by M. C. Tanquary (pp. 37–42). The text of the laws, rules, and regulations governing the commission are appended.

Forty-ninth annual report of the entomological society of Ontario, 1918 (*Ann. Rpt. Ent. Soc. Ontario, 49 (1918), pp. 126, figs. 22*).—Included in this report are the following papers on subjects of economic importance: Aphids—Their Human Interest, by A. C. Baker (pp. 28–32); Some Insect Problems in the Prairie Provinces, by N. Criddle (pp. 32–35); The Recovery in Canada of the Brown-tail Moth Parasite *Compsilura concinnata* (Diptera, Tachinidæ), by J. D. Tothill and L. S. McLaine (pp. 35–39); Present Day Problems in Entomology, by J. J. Davis (pp. 47–59); Insects as Agents in the Dissemination of Plant Diseases, by L. Caeser (pp. 60–66); The Cabbage Root Maggot (*Chortophila brassicæ*), by H. C. Huckett (pp. 67–69); Some Chapters of the Early History of Entomology, by W. Lochhead (pp. 69–81); The Pear Psylla in Ontario, by W. A. Ross (pp. 81–90); Control of the Apple Maggot, by L. Caeser and W. A. Ross (pp. 90–93); Our Garden Slugs, by G. Maheux (pp. 93–96); and The Entomological Record, 1918, by A. Gibson (pp. 97–123).

Report of the division of entomology, E. G. SMYTH (*Ann. Rpt. Insular Expt. Sta., Dept. Agr. and Labor, Porto Rico, 1918, pp. 109–129*).—Plant quarantine inspection work and the important insect pests intercepted are first reported upon. The possible transmission of the mottling disease of sugar cane by insects is then briefly considered.

The introduction into the island of the skunk and the toad in order to combat the white grubs of sugar cane, damage by which is increasing, is discussed and recommended.

A report of injury to sugar cane in the vicinity of Carolina on the north coast, received during September, 1917, led to the discovery of the occurrence of the dull black hard-back beetle (*Dyscinetus trachypygus*) in unusual numbers. Investigations show that the larvæ of this small dynastid beetle, which is very common in Porto Rico, feed upon decaying ratoons of sugar cane and other grasses and upon organic matter in the soil, such as manure and decaying green fertilizer, but do not attack healthy roots. The adults, however, injure sugar cane by feeding on the roots and underground stems of the young cane, in some cases as many as 20 or 30 adults having been dug from a single cane stool. Their feeding causes much of the cane to turn yellow and in spots causes its death. Trapping with lanterns placed over pans of water and kerosene and night collection of the beetles with lanterns by small boys are recommended. It is thought that possibly poison bait would prove effective.

An undetermined red spider or spider mite (*Tetranychus* sp.), pale yellowish-white in color, was discovered during the year to attack the foliage of sugar cane, occurring on both the upper and under sides of the leaves. The only previous report of attack of sugar cane by red spiders that has come to the author's attention is that by *T. exsiccator* in Java. Severe outbreak of the yellow cane aphis (*Sipha flava*) (E. S. R., 38, p. 762) in plats of young seed cane at the station at Rio Piedras and a similar outbreak at Central Fortuna at the east end of the island are recorded. Experiments conducted show that no benefit is obtained from spraying the aphis with a contact insecticide. Injury by adults of the large rhinoceros beetle (*Strategus quadrifoveatus*) to young coconut trees on a plantation near Rio Piedras was observed in April, and reference is made to several other complaints of injury by this species to sugar cane and coconut.

Mention is also made of the occurrence of the horn-fly, injury to cabbage by *Pontia monuste* and the diamond-back moth, attack of an orange-jassamine hedge (*Murraya exotica*) by the red scale (*Chrysomphalus aurantii*), an undetermined mealybug (*Pseudococcus* sp.) which is a new pest of peanuts reducing the fruiting capacity 50 per cent or more, and *Eutermes morio* which injures cane.

Thrips, black ants and other pests of cacao in Grenada, with a note on coconut disease, F. W. URICH (*Port of Spain, Trinidad: Govt., 1918, pp. 23, pls. 2*).—This is a report by the entomologist, presented to the Government of Grenada, and previously noted (E. S. R., 40, p. 856). See also a previous note (E. S. R., 41, p. 59).

[Report on economic insects in Hawaii], O. H. Swezey (*Proc. Hawaii. Sugar Planters' Assoc., 38 (1918), pp. 156–168, 190–202*).—This report discusses leaf hoppers; presents data on leaf-hopper parasitism; leaf hopper relation to eye spot; the Formosan egg parasite of the genus Ootetrastichus; a fungus disease (*Entomophthora* sp.) of the leaf hopper; the cane borer; control of the Anomala beetle; *Scolia manilae*, a successful Anomala parasite; other Anomala parasites; a cockroach parasite, *Dolichurus stantoni*, obtained from Los Baños; and a discussion of foreign entomological work.

[Economic insects in the Philippines], A. Hernandez (*Philippine Agr. Rev., 12 (1919), No. 2, pp. 87–95, pls. 4, fig. 1*).—In the annual report of the Bureau of Agriculture reference is made to the probable part that the adults of the palm weevils *Rhychophorus pascha* and *R. ferrugineus* may be found to play in the distribution of bud rot. A brief synopsis is given of the different pests attacking the coconut palm, particularly the rhinoceros beetle (*Oryctes rhinoceros*) and the two palm weevils mentioned. There is also an account of work in the control of tobacco, abaca, rice, and citrus insects. Control work with the rice bug (*Leptocoriza varicornis*) has shown both the adults and immature stages to be attracted for considerable distances by the smell of putrid meat, and that a 3 per cent solution of arsenate of soda mixed with the meat will kill all that partake of it.

Four of the most injurious corn pests, F. H. Dudley (*Bul. [Maine] Dept. Agr., 18 (1919), No. 1, pp. 27–30*).—The insect pests here dealt with are the European corn borer, the bollworm, the stalk borer, and the salt-marsh caterpillar.

Insects injurious to rice [in Guam], G. Briggs (*Guam Sta. Rpt. 1918, pp. 36–38, pls. 2*).—Three insects are now important enemies of the rice crop in Guam. They appear to have been introduced into the island, since the earlier reports of the station do not record injury to the crop.

The rice bug of India (*Leptocorisa varicornis*) is by far the most common and destructive of the three. Information relative to it based upon studies by Maxwell-Lefroy is presented. A leaf folder belonging to the subfamily Nymphulinæ of the Pyralidæ is a source of injury through folding the sides of the leaves together and fastening them with a sticky secretion, within which inclosure it feeds. Its principal damage seems to be in distorting and preventing the growth of the plant. Though commonly found on the west side of the island, its greatest damage was in fields located near Inarajan on the east side, where the crops were at least two months later. A stem borer, perhaps *Nonagria inferens*, a reference to which by Shiraki is noted on page 55, was a source of injury through working its way into the base of the stems near the ground or at the first joint. It bores upward, often eating one side of the stem, especially near the joints, causing the stalks to break and fall over, giving the appearance of badly lodged grain. This pest is said to have been common on newly broken ground, but infrequently found on old ground. Observations indicate that stopping irrigation for a time will aid in keeping the pest under control.

Insect enemies [of tobacco in Guam], G. Briggs (*Guam Sta. Rpt. 1918, pp. 42–44, pl. 1*).—A gryllid, *Heliothis assulta*, and the bollworm are the insects causing the most serious injury to tobacco in Guam. The application of arsenate of lead in both liquid and dry forms has been found to hold them in check, resulting in a much increased average yield.

Lasioderma serricorne and the tobacco moth, H. Jensen (*Proefsta. Vorstenland. Tabak [Dutch East Indies] Meded. 30 (1917), pp. 29*).—A brief account of the occurrence of and work with the cigarette beetle and *Setomorpha margalaestriata*.

[Coconut insects in Saipan], G. Briggs (*Gaum Sta. Rpt. 1918, pp. 53, 54, pl. 1*).—During the course of a trip by C. W. Edwards to the neighboring island of Saipan a scale insect was found to be causing considerably injury, practically every coconut tree on the island having been found to be badly infested. Approximately 10 per cent of the trees were found to have already succumbed to the pest and general production had ceased. The fruit and foliage of bananas, papayas, and breadfruit trees were also found infested, though in these cases the ill effects were not apparent to any great extent. The scales were so closely packed that they overlapped each other, entirely hiding the leaves and other parts to which they were attached. The species is thought to be *Aspidiotus destructor* rather than *A. oceanica*.

Destructive insects affecting Ohio shade and forest trees, J. S. Houser (*Ohio Sta. Bul. 332 (1918), pp. 165–487, figs. 208*).—This is a manual of information dealing with the subject under the headings of factors associated with insect control in cities, insect control possible under city conditions, intensive control measures rarely possible under forest or woodlot conditions, establishing a municipal tree-treating department, tree doctors, quacks, etc., spraying machinery and accessories, spraying materials, banding and banding materials, leaf or foliage destroying insects, scale and other sucking insects, and boring insects. A list of references to the literature and a complete subject index are included.

The bloodsucking insects of the Philippines, C. S. Banks (*Philippine Jour. Sci., 14 (1919), No. 2, pp. 169–189*).—A general discussion is followed by a list of the bloodsucking insects of the Philippines and a partial bibliography.

Use of toxic gases as a possible means of control of the peach-tree borer, E. B. Blakeslee (*U. S. Dept. Agr. Bul. 796 (1919), pp. 23, pl. 1*).—This is a report of investigations that were commenced in 1915.

Work with carbon disulphid and carbon tetrachlorid show it to be impossible to standardize them as treatments for the peach-tree borer, their great volatility at ordinary temperatures rendering them too sensitive to the varying conditions of soil porosity. Sodium cyanid on account of its solubility was too susceptible to the effects of variation in soil moisture and soil type and proved to be injurious to trees. Naphthalene on account of its low volatility within the seasonal range of soil temperatures was only a partially effective larvicide for a very short period in midsummer.

"P-dichlorobenzene has proved quite effective over a wide range of varying conditions imposed by field practice, with a considerable margin of safety for trees six years and over. In making the application the surface crust about the collar of the tree is broken. Excessive amounts of gummy exudations at the surface are removed. The lower levels of soil are disturbed as little as possible, and the required dose is distributed evenly about the trunk in a band 1 to 2 in. in width [as illustrated]. Two or three shovels of earth are then placed over the material, and compacted with the back of the shovel, being mounded slightly to cover the surface galleries [as illustrated].

"In the latitude of Washington and northern Virginia about September 10 has been found to be the most satisfactory time of application. Based in the insect's seasonal history, the theoretical time of application in the North generally would be about September 1; in the Ozarks, September 25; and in Georgia and the cotton belt, October 10.

"For 6- to 15-year-old trees of average size, doses of 1 oz. and of 0.75 oz. per tree have been found effective in destroying the borers without injury to the trees. For very large trees of advanced age, a somewhat increased dose may be desirable. As an added precaution against injury the base of the tree should be uncovered 4 to 6 weeks after application, allowed to remain open for a few days, and re-covered. This precaution is especially necessary if the application has been made very late.

"The use of p-dichlorobenzene in this way has been found to reduce the infestation on the average from 6.77 to 0.41–0.36 larvæ per tree, approximately a 94 per cent control."

The rice stem borer, Schoenobius incertellus, T. SHIRAKI, French trans. by J. LAN (*Bul. Econ. Indochine, n. ser. 21 (1918), Nos. 131, pp. 533–590, pls. 6; 132, pp. 885–954, pls. 11; 133, pp. 1033–1104, pls. 6*).—This is a monographic account of the pyralid moth borer *S. incertellus* [*bipunctifer*] which is based upon a review of the literature and studies conducted in Formosa, where it is the most important insect enemy of rice, the annual loss of grain due to "white head" being placed at 1,000,000 bu. Its attack results in the formation of white empty ears or "epis blancs." The percentage of stems attacked varied from 0.004 in the prefecture of Seikoo (Daito-cho) during 1910–1912 to more than 40 in the prefecture of Hokuto in 1911, the average for the island during the years 1910–1912 being placed at 2.72. While in general the injury caused by this pyralid is greater than that of other insects attacking rice, the hispa, the lema, and the leaf roller of young stalks, its injury is at times surpassed. The anatomy of its several stages, biology, and control are dealt with at length, together with studies of its natural enemies.

A comparison by the author of specimens from Japan and Formosa with the types of Walker and Zeller in the British Museum has shown *bipunctifer* to be the female of *incertellus*. The species is of wide distribution, occurring in Japan, Formosa, China, the southern part of India, Burma, Cochin China, Tonkin, Ceylon, Annam, Malayan Peninsula, Siam, Java, Sumatra, and the Philippine Islands. Rice appears to be the only host plant known to furnish subsistence, except in Burma, where it has been reported to also attack wheat, grasses, and weeds. Green reports its food plant as unknown in Ceylon, it apparently causing no injury there to rice. In extensive investigations in Formosa of the stems of a number of other Gramineæ which are reported upon in tabular form, the larvæ of *Chilo simplex* and *Nonagria inferens* were found, but none of *S. incertellus*. The author has found that there are from two to three generations each year in Japan and from four to six in Formosa.

Three species of hymenopterous parasites attack its egg in Formosa, namely, *Trichogramma japonicum*, *Ceraphron beneficiens*, and *Tetrastichus* sp., two of which are also abundant in Japan, and studies of them are reported upon at length. The parasites attacking the larvæ are *Shirakia dorsalis*, *Amyosoma chilonis*, *Stenobracon maculata*, *Apanteles simplicis*, *Eripternimorpha schoenobii*, *Eripternus* (?) *akoensis* n. sp., *Trathala* (?) *flavopedes* n. sp., *Aphiochæta parasitica* n. sp., etc. Mention is also made of predators which attack the several stages.

Tables are given for the separation of the several stages of *S. incertellus* from those of two other borers, namely, *C. simplex* and *N. inferens*. *C. simplex* bores in rice in precisely the same way as *S. incertellus* but does not go so far as the base of the stem. The larvæ of *S. incertellus* disperse immediately upon hatching, whereas 2 or 3 larvæ of the other two species may work in the same stem. *S. incertellus* and *C. simplex* almost always work in the stem, the attack of which by the former is quite regular. *N. inferens* does not always work in the stem, which it attacks quite irregularly, but sometimes attacks the exterior.

Methods of control are considered at length under the headings of resistance of varieties of rice, collection of affected stalks, collection of egg clusters, collection of the moths by trap lights, destruction of the stubble by burning, plowing the stubble under, submersion of stubble, cutting stubble, and use of insecticides. Of these the author concludes that the treatment of the stubble that is found to be the most practical comes first, and then the collection of egg clusters before the rice heads out. Many of the data are presented in tabular form.

A list of 39 references to the literature is included.

An account of this pest in India is given by Basu and Dutt in the work previously noted (E. S. R., 32, p. 449).

Occurrence of malaria and anopheline mosquitoes in northern California, W. B. Herms (*Calif. Bd. Health Mo. Bul., 15 (1919), No. 1, pp. 1–9, figs. 8*).—A brief report upon a mosquito survey.

The Cicadellidæ or leaf hoppers of South Carolina, F. H. Lathrop (*South Carolina Sta. Bul. 199 (1919), pp. 119, figs. 51*).—This is a synopsis of the Cicadellidæ, better known as the Jassidæ, in which the author recognizes 119 species representing 37 genera as occurring in South Carolina. The life zones and leaf-hopper distribution of the State are briefly considered.

The flat-headed apple-tree borer, F. E. Brooks (*U. S. Dept. Agr., Farmers' Bul. 1065 (1919), pp. 12, figs. 13*).—A summary of information on this pest, based upon investigations conducted by the author.

Xyleborus destruens destructive to djati (Tectona grandis), W. Roepke (*Treubia [Dutch East Indies], 1 (1919), No. 2, pp. 68–72, figs. 16*).—This scolytid beetle, common and a source of considerable damage in old cacao plantations, has been found to attack healthy young teak or djati trees.

Beginner's bee book, F. C. Pellett (*Philadelphia and London: J. B. Lippincott Co., 1919, pp. 179, pl. 1, figs. 17*).—A popular handbook.

Javanese chalcid flies, A. A. Girault (*Treubia [Dutch East Indies], 1 (1919), No. 2, pp. 53–60*).—Among the 16 species here considered, representing 13 genera, 13 are described as new and two genera are erected. *Epaenasomyia pallidiceps* n. g. and n. sp. and *E. xylocopae* n. sp. are recorded as having been reared from larvæ of *Xylocopa caerulea* at Buitenzorg, Java, by Roepke; and *Philotrypesis javae* n. sp. is recorded as having been reared from fruits of a wild fig at Nobo, Central Java. Notes on several of these species by W. Roepke follow.

FOODS—HUMAN NUTRITION.

How shall we be fed? (*Comment Nous Alimenter. Paris: Libr. Bernard Grasset, 1919, pp. 104*).—This monograph, the work of M. Mignon and various collaborators, contains the following chapters: Historical and Geographical Survey of the Food Régime of the Human Race, by E. Jeanselme (pp. 7–24); Physiology of Nutrition, by G. Lusk (pp. 25–34); Food Restrictions and the Public Health, by J. Renault (pp. 35–41); Food in Time of War According to Individual, Professional, and Social Conditions, by M. Labbé (pp. 42–64); The Composition and Energy Value of Foods and the Scientific and Economic Evolution of Food Problems During the War, by M. Mignon (pp. 65–103).

The final chapter gives a brief survey of the contributions of science to the problems of nutrition and an excellent summary of the evolution of the economic situation with reference to food during the war in Belgium, France, Great Britain, Italy, and the United States. The food situation in neutral and enemy countries during and at the close of the war is also discussed briefly.

Contribution to the study of the potato, its food value and utilization in bread baking, E. MAUREL (*Rev. Hyg. et Police Sanit., 40 (1918), No. 1, pp. 104–132*).—This is a general article.

The constipating qualities of orange juice, H. J. GERSTENBERGER and W. M. CHAMPION (*Amer. Jour. Diseases Children, 18 (1919), No. 2, pp. 88–92*).—Observations on a normal infant of 10 months of age, to ascertain the relative cathartic or laxative effect of orange juice and of an equal amount of a 10 per cent sugar solution containing 6.5 per cent glucose and 3.5 per cent sucrose, are reported which indicate that the orange juice was less laxative than the sugar solution when given in doses of 15 cc. six times in 24 hours. During the sugar solution period from 95.71 to 96.53 per cent of the water output was through the kidneys, and from 4.29 to 3.27 per cent through the intestines, while in the case of the orange juice from 97.15 to 97.25 per cent of the water output was through the kidneys and from 2.85 to 2.74 per cent through the intestines.

"This observation confirms our practical experience that orange juice in the maximum amounts ordinarily used has more of a constipating than a laxative effect, and, therefore, should only be used as an antiscorbutic or as a diuretic, but not as a laxative, and especially not for children who are already constipated."

The relative content of antiscorbutic principle in limes and lemons (*Lancet [London], 1918, II, No. 22, pp. 735–738*).—This investigation of the relative antiscorbutic properties of limes and lemons consists of an experimental inquiry by H. Chick, E. M. Hume, and R. F. Skelton, and an historical inquiry by A. H. Smith.

In the first part data are given with guinea pigs and monkeys as experimental animals, indicating that the antiscorbutic value of the juice of fresh limes (*Citrus medica acida*) is only about one-fourth that of fresh lemons (*C. medica limon*). Preserved lime juice was found useless for the prevention of scurvy.

These results are confirmed by a historical study of lime juice in connection with human scurvy. It is shown that at the period when scurvy was eliminated from the British navy by "lime juice" the term was used for the juice of lemons, and that it was not until the second half of the nineteenth century, when the juice of West Indian limes was adopted in the navy and mercantile marine, that the disease again made its appearance.

The antiscorbutic value of dry and germinated seeds, H. CHICK and E. M. DELF (*Biochem. Jour., 13 (1919), No. 2, pp. 199–218, figs. 5*).—The authors have confirmed Fürst's observations (E. S. R., 27, p. 567) that the content of the antiscorbutic accessory factor in dry peas and lentils is increased by germination. Seeds which had been soaked in water for 24 hours and germinated for 48 hours at room temperature were found to have from five to six times the antiscorbutic value of the dry seeds and to compare favorably with many fresh vegetables. A daily ration of 10 gm. (dry weight 5 gm.) was found sufficient to prevent scurvy in guinea pigs, an amount somewhat greater than that required in the case of raw cabbage, swedes, or fresh orange or lemon juice, but less than the requirement of raw carrot or beet root.

The experiments described also indicate that the seeds, whether in the dry or germinated condition, do not contain a sufficient amount of the growth-promoting substances to induce satisfactory growth in the experimental animals in the absence of milk from the diet, and that a considerable proportion of the antiscorbutic power generated in the germinated seeds is destroyed by boiling.

Attention is called to the experience of Wiltshire (E. S. R., 41, p. 861) and others as to the practical value of germinated seeds in the prevention of human scurvy.

Botulism from canned asparagus, C. THOM, R. B. EDMONDSON, and L. T. GILTNER (*Jour. Amer. Med. Assoc., 73 (1919), No. 12, pp. 907–912*).—An extensive study, conducted at the Bureau of Chemistry, U. S. Department of Agriculture, is reported of a strain of *Bacillus botulinus* isolated from canned asparagus which caused four deaths at Boise, Idaho, in January, 1919. The strain, which is designated the Boise strain, was found to have an optimum growth temperature of 37° C. (98.6° F.) and high heat resistance, the spores surviving 10 lbs. pressure for 15 minutes or 100° for one hour. In these respects the Boise organism resembles one of the strains (No. III) isolated by Dickson (E. S. R., 40, p. 176), but differs markedly from the organism of van Ermengem and the Nevin organism as studied by Shippen (E. S. R., 41, p. 169).

The toxin produced by the Boise organism, which varied in strength with changes in cultural conditions, was destroyed by heating to 75° or by heating for 10 minutes at 73°. Bacilli freed from toxin by repeated washing or spores freed from toxin by heat did not produce symptoms of poisoning when fed or injected, but were recovered in virulent form from feces of fed animals.

All cultures of the Boise organism had a characteristic and offensive odor which was clearly evident in the canned material from which the strain was isolated. It is pointed out that the fact that the asparagus was eaten in spite of the evidence of spoilage contradicts the opinion of Weinzirl (E. S. R., 40, p. 764) that food which is offensive or putrid is automatically discarded as unfit for human consumption.

The authors conclude that successful canning, so far as the danger from such strains as the Boise organism is involved, depends not so much on the method of work selected as on the rejection of infected material at the start by using only fresh, sound, clean fruits and vegetables, and eliminating sources of contamination in the utensils and water employed. "Decomposition occurring in a can or jar properly packed, exhausted, and sealed is necessarily anaerobic. When physical evidence of such decomposition is present, the material should be destroyed, not eaten."

Baking experiments with so-called egg substitutes.—The use of so-called egg substitutes in sponge cakes (*Bul. Kans. Bd. Health, 15* (*1919*), *No. 5, pp. 74, 75*).—From experimental work the conclusion is reached that "a true sponge cake, one in which no baking powder is used, can not be made by substituting half the number of eggs with commercial egg substitutes. In all cases the cakes stuck to the pan when done, which is not true of a good sponge cake, and this sticking was due to the sugar in the mixture cooking to the tin."

A baking test, undertaken to determine whether or not the addition to an original recipe, excluding eggs and substitutes, of more baking powder than called for gave favorable results as compared with a cake in which substitutes were used, showed an increase in volume comparable to that obtained with the use of egg substitutes.

"It would seem that the manufacturers of many of these so-called egg substitutes are exploiting the name of a highly valuable and high-priced food to further the sale of their product."

Artificial honey, A. Behre and H. Ehrecke (*Chem. Ztg., 43* (*1919*), *No. 38-39, pp. 153-155*).—The authors discuss the preparation of artificial honey and the factors governing its physical properties. The suggestion is made that to distinguish the artificial product from real honey the addition of some easily detected substance, such as phenolphthalein or starch, should be required by law.

Maté, or Paraguay tea, or St. Bartholomew's tea (*Hotel Mo., 27* (*1919*), *No. 316, pp. 62, 63*).—A popular summary regarding the nature and uses of maté.

Note on the importance of accurate and quantitative measurements in experimental work on nutrition and accessory food factors, H. Chick and E. M. Hume (*Jour. Biol. Chem., 39* (*1919*) *No. 2, pp. 203-207*).—The authors criticize much of the recent experimental work on accessory food factors on the ground that "in most of this work one fundamental consideration, namely that of quantity, has been to a large extent overlooked in the methods adopted for experiment, and the conclusions drawn have been untrustworthy to a corresponding degree." Attention is called particularly to the conclusions reached by Daniels and McClurg (E. S. R., 40, p. 565), in a study of the influence of high temperatures and dilute alkalis on the antineuritic properties of foods, as an illustration of this point.

The necessity is pointed out, in investigating the effect of heat, drying, or any other method of preservation, of determining the minimum daily dose of (1) the original untreated material, and (2) the same material after heating, drying, etc., which will protect the same experimental animal under similar experimental conditions.

Vitamin requirements of certain yeasts, F. M. BACHMANN (*Jour. Biol. Chem., 39 (1919), No. 2, pp. 235–257, pl. 1*).—A study is reported of the vitamin requirements of two strains of yeast, one isolated from commercial Yeast Foam and one from fermenting canned pears. Earlier experiments with two other strains of yeast from Yeast Foam are also noted.

The organisms studied were found to vary in their needs for traces of organic matter other than sugar, although all grew better and fermented more readily in a medium containing small amounts of organic material. The yeast isolated from fermenting canned pears was not able to grow in, or ferment, a solution of inorganic salts plus sugar unless introduced in very large amounts. Substances rich in vitamins, especially water-soluble B, brought about the fermentation of this yeast even when present in very small quantities. This is thought to indicate that this particular yeast is unable to synthesize its own vitamins. It is suggested that such yeasts as this might be used to determine the presence and amount of certain vitamins in various substances.

The action of ultra-violet rays on the accessory food factors, S. S. ZILVA (*Biochem. Jour., 13 (1919), No. 2, pp. 164–171, figs. 4*).—An investigation is reported of the effect of ultra-violet rays on the accessory food factors. Lemon juice from which the citric and other acids had been removed was used as a source of the antiscorbutic factor, autolyzed yeast of the antineuritic or water-soluble B factor, and butter of the fat-soluble A factor. Possible loss of potency was studied by means of feeding experiments with guinea pigs, pigeons, and rats, respectively.

It was found that exposure of treated lemon juice to ultra-violet rays in neutral condition and at a pH of 2.34 for 8 hours did not affect its antiscorbutic activity, and a similar exposure of autolyzed yeast juice did not impair its antineuritic property. Butter, however, when exposed to ultra-violet light for eight hours became entirely bleached, acquired a tallow-like odor, and was quite unpalatable. Feeding experiments demonstrated that the fat-soluble A had become inactivated.

Attention is called to the observations of many investigators that the sterilization of milk by means of ultra-violet rays imparts a peculiar taste to the milk, and the explanation is offered that this is due to the alteration in butter fat brought about by the exposure. The inactivation of the fat-soluble factor points to a further decrease in nutritive value particularly undesirable from the point of view of infant feeding.

Note on xerophthalmia in rats, E. C. BULLEY (*Biochem. Jour., 13 (1919), No. 2, pp. 103–106*).—The author traces from the literature on the subject the origin and growth of the idea that xerophthalmia is due to the absence of fat-soluble A, and presents evidence from unpublished experiments of Hopkins and of Totani and from observations of a colony of 500 young rats on varying experimental diets to indicate that "with avoidance of initial infection, experimental animals can be kept almost entirely free from this so-called deficiency disease, whether fat-soluble A be present or absent, and that it is dangerous to draw conclusions as to the fat-soluble A content of any diet from the appearance of xerophthalmia."

The author's own experience which led to this conclusion was that in 500 young rats fed on experimental diets five cases only of xerophthalmia occurred, two on a diet in which fat-soluble A was supplied to a limited extent, one on a diet in which it was presumably present in sufficient quantity, one on a diet from which it was absent, and one on an ample stock diet. Two of the animals which developed xerophthalmia were growing moderately well, one lost in weight, and one neither lost nor gained in weight. In each of the experiments, which lasted for three or four months, there were at least eight other animals on the respective diets showing no symptoms at all.

In the experiments of Hopkins and of Totani, the rats fed upon the same diets deficient in fat-soluble A developed xerophthalmia in one case and were free from it in the other. This discrepancy in results is considered to be due to infection present in the former case and not in the latter.

The effect of alcohol on the digestion of fibrin and caseinogen by trypsin, E. S. Edie (*Biochem. Jour., 13 (1919), No. 2, pp. 219–225*).—Alcohol, when present to the extent of 3 per cent or more, was found to have a marked inhibitory effect on the action of trypsin on fibrin. The digestion of caseinogen by trypsin, on the other hand, was not affected until the concentration reached 10 per cent. This is thought to indicate that if trypsin is a single enzym the digestion of fibrin and caseinogen is probably carried on by different side chains, those digesting fibrin being much more readily affected by alcohol than the others.

A study of the fat metabolism of infants and young children.—I–IV, L. E. Holt, A. M. Courtney, and H. L. Fales (*Amer. Jour. Diseases Children, 17 (1919), Nos. 4, pp. 241–250; 6, pp. 423–439; 18 (1919), Nos. 2, pp. 107–126; 3, pp. 157–172*).—Four studies are reported.

I. *Fat in the stools of breast-fed infants.*—A study is reported of the fat content of the stools of breast-fed infants and the distribution of the fat as soap, free fatty acid, and neutral fat as determined by the method previously noted (E. S. R., 40, p. 207). The material examined consisted of 48 collections of feces from 34 infants varying in age from 10 days to 10 months.

The fat of the stools of normal breast-fed infants averaged 34.5 per cent of the dried weight, and was frequently as high as 50 per cent. In the best stools the soap fat averaged 57.8 and the neutral fat 15.9 per cent of the total fat. No constant relation was shown between the percentage of fat in the mother's milk and the percentage and distribution of fat in the stool. With a higher total intake of fat, the total fat and soap fat in the stool were somewhat increased. A range of fat absorption from 90.3 to 99.2 per cent of the intake was found in healthy breast-fed infants.

II. *Fat in the stools of infants fed on modifications of cow's milk.*—A study was made of the fat in the stools of infants fed on cow's milk or various modifications of it, with or without carbohydrate additions. The material examined consisted of 128 stools of 77 infants whose ages ranged from 2 to 18 months.

The total fat averaged 36.2 per cent of the dried weight in normal stools and 40.7 per cent in cases of severe diarrhea. The amount of soap in percentage of total fat was very high in both normal and constipated stools, averaging respectively 72.8 and 73.8 per cent, while in cases of diarrhea it fell to as low as 8.8 per cent of the total fat. The neutral fat was less than 10 per cent of the total fat in normal and constipated stools, and increased in diarrhea to about 60 per cent of the total fat. The free fatty acids increased from about 17 per cent of the total fat of normal and constipated stools to over 30 per cent in the diarrheal stools. The average fat retention was 91.3 per cent of the intake in the case of normal stools and dropped to 58.4 per cent in severe diarrhea. No striking relation was noted between the fat intake and fat retention or the percentage or distribution of fat in the stool.

III. *Fat in the stools of children on a mixed diet.*—In a similar study of the percentage and distribution of fat in the stools of a number of children receiving a mixed diet, the material examined consisted of 134 collections of the feces of 62 children from 1 to 10 years of age. The first part of the report deals with the observations made on healthy children whose digestion was nearly or quite normal, and the second part with observations on abnormal cases, including cases of rickets and of chronic intestinal digestion.

In the normal or constipated stools of older children whose diet consisted largely of milk, the fat percentage of the dried weight averaged 30.7 and in those on a mixed diet 18 and 20.1, respectively. The corresponding soap values in percentage of total fat were 60.9, 45.1, and 47.9 per cent, respectively. In the acid abnormal stools of children on a mixed diet, the fat percentage of dried weight and the soap percentage of total fat were lower and the values for fatty acids and for neutral fat higher than in normal stools. The normal children on a mixed diet retained on the average about 94 per cent of the fat intake, regardless of the type of stool. The average actual retention was about 38 gm. daily. The children with little or no solid food and a smaller intake showed a lower actual and a somewhat lower percentage retention than those on a general mixed diet.

With rachitic children the fat percentage of dried weight averaged 34.7 in the alkaline stools and 24.6 in the acid stools. The proportions of soap, fatty acids, and neutral fat were not significantly different from those for normal children. The actual retention of fat equalled or exceeded that of the normal children, and the percentage retention was only a little lower than the normal average.

The stools of children suffering from chronic intestinal indigestion showed a much higher fat percentage of dried weight than those of normal children, the average for alkaline stools being 36.4 and for acid stools 35.3 per cent. The neutral fats were lower and fatty acids higher than normal. Both actual and percentage retention of fat were lower than normal.

IV. *The digestion of some vegetable fats by children on a mixed diet.*—A study is reported of the digestion of various brands of nut margarin and of corn oil by children on a mixed diet.

The stools of children receiving a considerable proportion of vegetable fat did not differ essentially in appearance from those of children receiving mainly milk fat, although they were usually somewhat softer. The fat percentage of dried weight of the stools averaged somewhat lower with nut butter and somewhat higher with corn oil than with milk fat. The soap percentage of total fat was usually a little lower and the neutral fat a little higher with vegetable fat than with milk fat. When vegetable fat formed a considerable part of the total fat intake, the percentage of the fat retained was usually higher than the normal average.

Individual children observed for considerable periods with changes in the kind and amount of fat intake showed quite as good digestion of vegetable fat as of corresponding amounts of milk fat, with no unfavorable effect on general health and nutrition. No children were kept long enough on a diet deficient in fat-soluble A to warrant any conclusions in regard to the effect of such a diet upon growth and health. One child kept for five weeks on a diet in which 95 per cent of the fat was furnished by corn oil ceased to gain in weight, but showed no loss. Of six children, 80 to 95 per cent of whose fat intake was vegetable fat, two developed styes, and two others eczema, which disappeared when the diet was changed to include milk fat.

"The observations published in this paper indicate that corn oil and nut butter, the vegetable fats studied, are valuable foods for children, are exceedingly well borne, and are apparently digested and absorbed with ease. We feel, therefore, warranted in the belief that these articles may safely be introduced into the regular diet of children, and that to a considerable degree they may be substituted for the more expensive milk fat, given either as milk or as butter, but they should never entirely replace milk fat. How much milk fat is needed to furnish the amount of the fat-soluble vitamin required for normal growth and nutrition we have not yet the data to determine."

Human vitality and efficiency under prolonged restricted diet, F. G. Benedict, W. R. Miles, P. Roth, and H. M. Smith (*Carnegie Inst. Wash. Pub. 280 (1919), pp. XI+701, pls. 19, figs. 91*).—This publication contains the detailed report of the investigation of the effects of a prolonged restricted diet which has been previously noted from other sources (E. S. R., 40, p. 269).

Prefacing the details and results of the research, a general history is given of the experimental work leading up to the present study, together with brief abstracts and discussion of the work of other investigators on metabolism with a low intake of food. This is followed by an explanation of the purpose and plan of the research, the selection of subjects, and the general program of the research. The methods as a whole are classified as follows: The control, preparation, sampling, weighing, and analysis of food; the collection, preservation, sampling, and analysis of feces and urine; the grosser physical measurements such as weight, height, surface area, and body photographs; record of muscular activity; clinical examinations, including blood pressure, blood examination, and records of pulse rate and body temperature; measurement of the gaseous metabolism; quantitative measurements of muscular work; and measurements of the neuro-muscular processes.

Several of these measurements were carried out with essentially new technique, some of the apparatus and methods being specifically designed for this research. The new apparatus includes a portable respiration apparatus, a description of which has been previously noted from another source (E. S. R., 40, p. 269), and a large group-respiration chamber, a detailed description of which is given.

The main part of the monograph is devoted to a presentation and discussion of the experimental data. The depression in the total metabolism, with accompanying depression in other physiological factors such as blood pressure and pulse rate, is considered the most prominent feature of the entire research. The most obvious cause of this lower metabolism is thought to be the removal of some 175 gm. or more of nitrogen from the body, resulting in a withdrawal from the fluids bathing the cells of a large amount of nitrogenous material.

Attention is called to the possibilities of the use of this procedure in many pathological conditions where benefit would arise from the removal of large amounts of surplus nitrogen and from lowering the metabolism perceptibly. The feasibility of dietetic restrictions as a food-conservation measure is also noted, with, however, emphasis upon certain factors which might make such a procedure unwise in the long run.

"We may say, in summarizing, that protein curtailment is an assured and physiologically sound procedure, and a reduction in calories is possible for a long period, but definite and significant disturbances of blood composition, normal sex expression, and neuro-muscular efficiency, and the appearance of mental and physical unrest are deterrent factors in too sweeping generalizations as to the minimum calories being synonymous with an optimum level."

ANIMAL PRODUCTION.

On the probable error of Mendelian class frequencies, S. WRIGHT (*Amer. Nat., 51 (1917), No. 606, pp. 373–375*).—Without denying their theoretical foundation, the author contends that the methods of computing the probable errors of Mendelian frequencies proposed by Pearl (E. S. R., 37, p. 432) are too complex for practical use. He shows that the ordinary formula when applied to the illustrative data discussed by Pearl is nearly as satisfactory as Pearl's long method and better than his approximate method.

A method for the mathematical determination and measurement of the degree of inbreeding, J. KŘIŽENECKÝ (*Ztschr. Landw. Versuchsw. Österr., 19 (1916), No. 3–4 pp. 99–102*).—It is pointed out that the symbol q_{n+1} in the coefficient of inbreeding formula suggested by Pearl (E. S. R., 30, p. 66) represents by definition the number of different individuals actually involved in the matings of the $(n+1)$th ancestral generation, but that in practice Pearl uses it to mean the number of different individuals which appear in this but in none of the n succeeding generations in the pedigree. A literal following of the definition in the case of parent and offspring matings results in lower coefficients than those given by Pearl.

The author thinks that there should be a single numerical expression for all the inbreeding exhibited by a pedigree, and suggests the following formula for a coefficient of inbreeding based upon all the ancestral generations under consideration:

$$I_n = \frac{100\,(p_n - q_n)}{p_n},$$

in which p_n is the maximum possible number of ancesters of an individual in n generations and q_n the actual numcer.

See also a later paper by Pearl (E. S. R., 38, p. 269) giving a method of passing from his separate generation coefficients to a pedigree coefficient.

On the composition and feeding value of tree-leaf hay, MAYR (*Forstw. Centbl., n. ser., 40 (1918), No. 5, pp. 161–165*).—The proximate composition of cured leaves of forest trees is reported.

Commercial feeding stuffs, 1918–19, C. D. WOODS (*Maine Sta. Off. Insp. 92 (1919), pp. 21–60*).—This is the annual report on the registration and official inspection of feeding stuffs sold in Maine. Analytical results are not given but merely statements for each sample as to whether it conforms to guaranty.

Commercial feeding stuffs, A. J. PATTEN ET AL. (*Michigan Sta. Bul. 285 (1919), pp. 3–91*).—The moisture, protein, fat, and fiber content of 1,530 samples of feeding stuffs collected during the year ended June 30, 1919, are tabulated. The prices are added in most cases. The materials listed include alfalfa meal, barley feed, barley meal, cull-bean meal, brewer's dried grains, buckwheat bran, cottonseed meal, cottonseed feed, corn-germ meal, corn-gluten feed, hominy feed, corn-feed meal, corn-and-oat feed, distillers' dried grain, dried beet pulp, linseed meal, oatmeal by-product, pea bran, peanut bran, rye feed, wheat bran, bran with screenings, middlings, middlings with screenings, shorts with screenings, red dog, yeast and vinegar dried grains, tankage, meat scrap, and various proprietary calf meals, hog, stock, horse, poultry, pigeon, and mixed feeds.

Safeguarding feeders of cottonseed products, L. A. Fitz and A. E. Langworthy (*Kansas Sta. Circ. 71 (1918), pp. 4*).—Cattle feeders who use cottonseed cake or cottonseed meal are urged to protect themselves by reweighing shipments as they are received and by having samples analyzed chemically so as to claim a rebate in case the product is not up to guaranty. The method of computing rebates for deficiency in protein is explained, and the classes and grades of cottonseed by-product feeds are defined.

Animal husbandry, C. W. Edwards (*Guam Sta. Rpt. 1918, pp. 7–29, pls. 5*).—Under this heading are included summaries of the experimental and cooperative demonstrations work done on the island with horses, cattle, swine, goats, and poultry from 1911 to 1917 and progress reports of the 1918 results.

The work with Morgan horses terminated in September, 1918, by the transfer of most of the stud to the naval authorities. It is noted that Para as soiling grass and *Paspalum dilatatum* as pasture proved the most satisfactory roughages for these horses. Alfalfa hay was more effective than Para grass in increasing the weight of animals in poor condition when oats constituted the grain ration. Native roughages without grain were not satisfactory. In a three months' feeding test with 6 horses a mixture of copra meal and oats (1:1) gave as good results as an exclusive oat ration. Half of the regular oat ration of 4 horses was replaced by native corn for a number of months without loss of weight or other ill effects. Several native forage plants were found to be injurious.

The imported Morgans of both sexes were very irregular breeders. Several offspring were secured from matings with the small native ponies. The grades when mature weighed about 700 lbs. They showed marked improvement in size and conformation over the native parent, while retaining the hardiness of the latter and being able to subsist on native pasture. The fears of the islanders that their small mares would be unable to deliver the grade foals proved groundless.

In connection with the herd of Ayrshires and Ayrshire grades, particular attention has been devoted to the improvement of pasture. A comparison of Para grass and native grass pastures was concluded in August, 1918. The 6 months' gain in weight of 4 cows on Para pasture varied from 96 to 219 lbs. The weights of 4 somewhat heavier cows on native pasture decreased during the same period, the greatest individual loss being 180 lbs. It is stated that the imported animals, at least for the first few years after their introduction, required a fairly heavy grain ration in addition to improved green forage, whereas the Guam-raised pure-breds can be maintained on the forage alone.

Tests with swine in 1918 indicated that a mixture of cooked breadfruit and grated coconut (3:1) could be used to replace half the grain fed growing pigs on Para pasture without seriously impairing the gains and with a material reduction in cost. It was also observed that neither growing pigs nor mature sows would eat the vines or the fruits of the jack bean at any stage of development. Velvet bean pasture was eaten readily by brood sows and sparingly by pigs. An unfinished test comparing free range of pasture with the tethering method frequently practiced by the Chamorro farmer indicates that the former method of handling swine produces quicker gains.

The Berkshire has proved well adapted for crossing with native stock. A group of 6 first-generation grades on Para pasture supplemented with grain gained 78.7 lbs. per head in 185 days while 5 native pigs fed similarly gained only 37.8 lbs. per head in the same period.

The work with goats consists chiefly of grading up the native stock, and has thus far been interfered with to a considerable extent by disease and parasitic worms. Milk is almost absent from the native diet, and it is held that a few goats of good type kept by each family would supply this deficiency.

The poultry work in 1918 was confined largely to the development of the station's breeding flocks of Brown Leghorn and Rhode Island Red crosses. The hatching percentages were low throughout the season, but the chicks were vigorous. Eggs held longer than 10 days before incubation hatched very poorly. Papayas proved a useful tree in chicken yards. They not only furnish shade but the ripe fruit is eaten with relish by chicks and older fowl alike.

Composition of the beef animal and energy cost of fattening, P. F. TROWBRIDGE, C. R. MOULTON, and L. D. HAIGH (*Missouri Sta. Research Bul. 30* (*1919*), *pp. 3–105, pls. 12, figs. 25*).—This publication belongs in the series (E. S. R., 40, p. 567) reporting the detailed experimental results of the station's "use of food" project, and deals with (1) the chemical composition of the gain of fattening steers and (2) the changes in the body form of steers on maintenance and during fattening. The main results from the first have been noted from the preliminary report of Moulton (E. S. R., 41, p. 769). In addition to the records of the three steers (Nos. 18, 121, and 48) used principally in this phase of the investigation, supplementary data from the other four animals of the "regular maintenance" group are included. The individual feed records of this group during prolonged maintenance and the results of the digestion trials of 5 animals are given in much greater detail than in Research Bulletin 18 (E. S. R., 33, p. 569). The nutrients consumed during the full feeding period following maintenance by steers 121 and 48 and by two of the supplemental steers, the weights of the different carcass and offal parts of each of the seven animals, and the chemical composition of the organs and the wholesale carcass cuts of 18, 121, 48, and one of the other steers are all completely tabulated.

To study the change in form a large number of body measurements were made of the animals at frequent intervals, and the contours of the body at the level of the shoulders and at the paunch were determined by means of a hinged "wheel" with movable spokes or by a special chain in which any link could be held in a fixed position relative to adjoining links by tightening set screws. Some of the more important measurement data were destroyed by fire; the others are tabulated and briefly discussed.

It is estimated that in carrying steer 121 from the thin condition of steer 18 to the medium fat condition in which it was at slaughter, the lean flesh of the carcass was increased 54 per cent and the removable fatty tissue 284 per cent, while the total carcass increased 76 per cent. This increase is not considered wasteful, as the fat "would all have been eaten by the lover of good meat." However, the prime steer (48) showed 122 per cent more fat and only 20 per cent more lean than the medium, the carcass having increased 47 per cent in weight. "The fat in the highly finished animal was too plentiful for the tastes of normal individuals," and the energy used to produce it was thus wasted.

Cost of raising beef cattle in New Hampshire, E. G. RITZMAN (*New Hampshire Sta. Bul. 182* (*1919*), *pp. 5–15*).—For about 11 months beginning December 1, 1917, records were kept of the cost of feeding and caring for a small group of Hereford steer calves that had been shipped from Texas. During the first half of the period 10 steers were fed an inferior grade of native or stock hay supplemented with cottonseed meal and bran (2:1), and during the rest of the time the 7 which were not killed by a locomotive were kept on pasture without additional concentrates.

The initial weight was 343 lbs. per head and the gain during the winter averaged 161 lbs. or about 1 lb. per day. To make this gain the group consumed about 8.9 tons of hay and 2.5 tons of concentrates (including some middlings). The initial cost of the steers was $425 and the interest on the investment was reckoned at $19. The hay, for which there was practically no demand at the time, was charged at $9, cottonseed meal at $52, and bran at $49 a ton. The other charges were $13.52 for middlings, $1.50 for salt, and $30.10 for 86 hours labor. At the end of the winter period the steers were valued at 14 cts. a pound. With an individual credit of $6.95 for manure, the profit per head was found to be $8.98.

The average weight of the 7 steers at the beginning of the pasture period was 547 lbs. The gain averaged 203 lbs. per steer, or about 1.2 lbs. daily. The monthly pasture charge was $1.50 per head. Interest on investment is placed at $17.40, and the charge for labor at $5 and for salt at $2. The steers were valued at 15 cts. a pound on October 26, giving a net profit of $27.04 per head for the pasture period.

A discussion of the economics of beef feeding in New England is included.

Winter feeding of beef cattle, C. N. Arnett (*Montana Sta. Circ. 85* (*1919*), *pp. 7*).—Brief summaries of recent experimental work at the station are presented as a basis for a series of suggestions for wintering mature beef stock.

The results secured in 1916–17 (160 days), previously reported by Joseph (E. S. R., 40, p. 472), and of a duplicate experiment in 1917–18 (150 days) are averaged. On straw alone 24 breeding animals with an average initial weight of 1,229 lbs. lost 194 lbs. per head. The same number of similar weight on straw plus 5 lbs. of hay daily lost 95 lbs. and those on straw plus 10 lbs. of hay, 58 lbs.

In 1918–19 (132 days) 12 animals with initial weights averaging 1,066 lbs. on straw alone lost 66 lbs. per head; another lot with initial weights of 1,155 lbs. fed straw and 5 lbs. of hay lost 12 lbs. and a third lot originally weighing 1,146 lbs. per head and fed straw and 1 lb. of cottonseed cake daily lost 10 lbs. per head. The 1918–19 hay was of better quality than that of the preceding years.

Government sheep ranch in Idaho, W. C. Coffey (*Breeder's Gaz.*, *76* (*1919*), *No. 23*, *pp. 1197, 1198*, *figs. 2*).—The author outlines the plans of the breeding work undertaken by the Bureau of Animal Industry of the U. S. Department of Agriculture on a 28,000 acre tract in Idaho for the purpose of developing types of sheep suitable for present day range conditions. Rambouillets are being crossed with long-wool breeds to make a well balanced wool and mutton animal, possessing in addition some of the close-herding instincts of the Rambouillet and yielding bright combing wool of desirable weight. The main problem is to produce a fixed type having the characteristics of this cross. Experiments with Corriedale crosses are also being carried out.

The sheep in Egypt, G. C. Dudgeon and Mohammed 'Askar (*Agr. Jour. Egypt*, *7* (*1917*), *pp. 1–5*, *pl. 1*).—A continuation of an article previously noted (E. S. R., 35, p. 68).

Forage crop experiments with swine, C. N. Arnett and W. E. Joseph (*Montana Sta. Bul. 128* (*1919*), *pp. 61–106*, *figs. 7*).—This bulletin is divided into two parts. The first is a study of the economy of different amounts of grain fed to weanling pigs on pasture and reports the following experiments; (1) Comparing one, two, and three per cent barley rations with 22 pigs on alfalfa pasture for 104 days in 1914; (2) a similar comparison with 29 pigs for 170 days in 1915, followed by a finishing period on barley, feed wheat, and tankage until the average body weight in each lot was 200 lbs.; (3) comparing no grain, self-fed barley, and one, two, and three per cent barley rations with 42 pigs on red clover pasture for 90 days in 1916, followed by a 30 day transition period on pasture with full feed of barley and a finishing period in dry lot on barley and tankage (25:2); (4) a similar comparison with 43 pigs in 1917 when the pasture season was 110 days and the transitional period 20 days; and (5) a comparison between a one per cent barley ration and a ration of 1 lb. per head per day made with 18 pigs on red clover pasture for 90 days in 1918 followed by a transitional period of 20 days and a finishing period.

The second part reports the following comparisons of forage crops for weanling pigs when supplemented with a 2 per cent barley ration: (1) Between rape pasture, barley pasture, rape and oats pasture, and oats pasture, made in 1915 with 28 pigs, and (2) between red clover pasture, sweet clover pasture, and rape pasture made in 1917 with 33 pigs. It also presents the results of a test in 1918 of mixed blue grass and white clover pasture in 1918 when 1 lb. of barley was fed per pig per day.

It is concluded that alfalfa pasture was better than red clover for young pigs, and that rape was the only one of the annual crops tested which proved satisfactory. A one per cent barley ration with tankage as part of the finishing ration gave the most economical results under the system of management adopted. The preliminary tests in feeding 1 lb. of barley per head daily gave favorable results. It is pointed out that this simple and convenient method supplies liberal amounts of grain while the pig is small.

Tabular summaries of some of the data published are given below in the following abstract.

The use of forage crops in pork production, C. N. Arnett and W. E. Joseph (*Montana Sta. Circ. 83* (*1919*), *pp. 69–84, figs. 5*).—This publication is mostly a summary of the experimental results reported in Bulletin 218. The following table presents the author's averages of the two alfalfa experiments (omitting the finishing period of the second) and of the 1916 and 1917 red clover experiments:

Results of feeding different amounts of barley to weanling pigs on alfalfa and red clover pastures.

Pasture.	Barley ration on pasture.	Pigs per acre.	Pasture season.	Additional dry-lot period.	Average daily gain per head.	Feed per pound of gain.		Feed and pasture costs per pound of gain.	Profit per head.
						Barley.	Tankage.		
			Days.	*Days.*	*Pounds.*	*Pounds.*	*Pounds.*	*Cents.*	
Alfalfa	1 per cent	14	137		0.43	1.23		6.3	$1.89
Do	2 per cent	15	137		.60	2.09		8.0	1.68
Do	3 per cent	17	137		.73	2.84		9.8	.81
Red clover	None	16	100	103	.81	3.29	0.24	11.5	2.18
Do	1 per cent	19	100	101	.84	3.32	.22	11.4	2.59
Do	2 per cent	21	100	95	.88	3.48	.20	11.7	2.01
Do	3 per cent	25	100	81	.94	3.57	.16	11.8	1.80
Do	Self-fed	30	100	70	1.01	3.87	.12	12.4	.82

Barley was charged at 3 cts. and tankage at 2.75 cts. per pound. The pasture charge per acre was put equal to half the hay crop at $15 a ton. The charge for the 1916 red clover was $25, and for the alfalfa and the 1917 red clover $20. The initial cost of pigs was put at 20 cts. a pound, and 18 cts. was taken as the value per pound at the end of the pasture season, and 14 cts. the value when finished for market.

The average results of the two rape experiments and the results from the 1915 experiments with barley, oats, and mixed rape and oats are summarized thus:

Comparisons of pastures for weanling pigs receiving a two per cent barley ration.

Pasture.	Pigs per acre.	Pasture season.	Average daily gain per head.	Barley fed per pound of gain.	Feed and pasture cost per pound of gain.	Profit or loss (—) per pig.	Returns per acre.	Pasture charge per acre.
		Days.	*Pounds.*	*Pounds.*	*Cents.*			
Rape	18	100	0.45	2.43	9.9	$1.23	$39.95	$18.00
Rape and oats	14	100	.43	3.14	12.9	.03	21.40	21.00
Oats	14	77	.47	2.81	12.4	.23	23.20	20.00
Barley	14	77	.42	3.06	13.6	—.19	17.28	20.00

Profits and returns are here based entirely on the increase in weight of the pigs, the increase being valued at 13 cts. a pound. Except for the difference in computing profits, the data in this table are comparable with those of the alfalfa lots receiving a 2 per cent supplemental ration presented in the first table.

Swine husbandry (*Penn. Dept. Agr. Bul. 307* (*1918*), *pp. 5–119, pls. 10, figs. 9*).—This is a new edition of Bulletin 186 (E. S. R., 24, p. 180), revised by J. M. Rosenberger. The section on markets is omitted, and those on housing and hog cholera are extensively modified. Brief paragraphs on self feeders and garbage feeding are added to the otherwise unchanged summary of feeding experiments. The illustrations are mostly new.

Observations on brachydactylism in the fowl, C. H. DANFORTH (*Abs. in Anat. Rec., 14* (*1918*), *No. 1, pp. 33, 34*).—The author has studied the anatomy, development, and inheritance of shortened toes in the domestic fowl.

The shortening, which is found to be of common occurrence, affects chiefly the fourth toe and is closely associated in occurrence and hereditary transmission with booting. The extent of shortening ranges from a condition in which all five phalanges are present but with a total length slightly less than normal to one in which the toe is greatly shortened and the number of phalanges is reduced to two. Brachydactylism is noticeable in embryonic stages when the cartilaginous phalanges are still rudimentary and before the first feather germs appear on the tarsi. Its hereditary behavior is irregular.

Concerning the summer plumage of the drake, H. D. GOODALE (*Abs. in Anat. Rec., 14* (*1918*), *No. 1, pp. 92, 93*).—The author reports that when castrated drakes of breeds like the Gray Call, Mallard, and Rouen molt in June they do not change to the ordinary summer (female-like) plumage. With normal drakes it is found that the change of plumage can be initiated by plucking the feathers at the height of the breeding season in March, but not earlier in the year. "The summer plumage develops coincidently with the period of greatest activity of the testes, while the breeding plumage, so-called, develops during the quiescent period."

Appliances and methods for pedigree poultry breeding at the Maine Station, J. W. GOWEN (*Maine Sta. Bul. 280* (*1919*), *pp. 65–88, figs. 13*).—This publication contains (1) an explanation substantially as in Bulletin 159 (E. S. R., 20, p. 473) of the use of the mating, "mother mating" index, and "chick-adult-mating" index record sheets in the loose-leaf system of record keeping employed in the station's poultry breeding experiments, (2) descriptions of three supplementary sheets, two of which were noted in Bulletin 165 (E. S. R., 21, p. 273), the permanent record of an individual hen's egg production, the weekly house egg record and the incubator record, (3) the accounts of the egg distributing and turning table and the pedigree incubator basket as originally given in Bulletin 165, and (4) a new section on banding chicks.

Back yard poultry keeping, J. C. GRAHAM (*Mass. State Dept. Agr. Circ. 1 (1918), pp. 3–40, pls. 2, figs. 6*).—This is a manual on the housing, feeding, management, and hygiene of small poultry flocks in towns and suburban communities.

The use of incubators in poultry breeding in Egypt, G. C. DUDGEON and MOHAMMED KAMEL (*Agr. Jour. Egypt, 8 (1918), pp. 1–9, pls. 8*).—Some of the jealously guarded trade secrets of the professional operators of egg ovens in Egypt are reported. Diagrams and photographs of the interior of the buildings are included. An oven consists of an upper and a lower chamber, each large enough for a man to move about in freely, connected by a central opening. Before the oven is used, horse manure is burned in the lower chamber to kill vermin and produce the proper initial temperature. Six piles of eggs are placed in the lower chamber, and for 10 days heat is provided by burning bean straw in the upper chamber. The egg heaps are moved about three times a day during this period to secure uniform heating. The operator judges temperature by pressing eggs to his eyelids. On the seventh day the eggs are candled by being held toward a ventilating aperture in the upper chamber. Infertile and dead-in-shell eggs are discarded. No heat is provided after the eleventh day. On the thirteenth day the eggs are spread out in both chambers. and apparently are not disturbed again.

It is stated that about 10 per cent of the eggs are infertile and about 70 per cent are successfully hatched.

DAIRY FARMING—DAIRYING.

Variation of Ayrshire cows in the quantity and fat content of their milk, R. PEARL and J. R. MINER (*Jour. Agr. Research* [*U. S.*], *17 (1919), No. 6, pp. 285–322, figs. 6*).—This is a report of a statistical investigation made at the Maine Experiment Station of the milk and butter fat records of Ayrshire cows in Scotland as reported by the Ayrshire Cattle Milk Records Committee for the seasons of 1908 and 1909 (E. S. R., 23, p. 780; 24, p. 580). The purpose of the investigation was to determine the amount and nature of the variation in mean weekly milk yield and in fat percentage for each year of age and to compute suitable algebraic formulas to express the changes in yield with advancing age.

Variation is studied by rather elaborate biometrical methods. For each year from the third to the twelfth, one of Pearson's generalized probability curves is fitted to the frequency distribution. For this purpose the records for 1908 and 1909 were combined except in the case of fat percentage of 3 and 4 year olds, where it seemed doubtful whether this lumping would be legitimate. In only one of the 22 distributions were the frequencies such that the normal (error) curve gave the best graduation. Pearson's type IV (unlimited range but unsymmetrical) was the most common curve, and was characteristic particularly of the milk yields of all but the older animals.

The data on the relation of milk production to age were fitted with a curve similar to that used by Pearl and Patterson (E. S. R., 38, p. 176) for Jersey data. The formula derived is

$$y=12.4766+0.6146x-0.0366x^2+3.6641\log x$$

in which y denotes the average weekly yield of an individual in gallons and $x+1$ is the age in years. This gives an arched curve which has a maximum at the age of about 11.5 years.

The fat percentage decreased with age, but the rate of decrease was less marked in the later years. The authors therefore divide their data into two parts at the 10-year point. The equations derived indicate a yearly decline of 0.0343 in the percentage of fat before this age and of only 0.0028 afterwards.

The variation of Ayrshire cows in the quantity and fat content of their milk, R. Pearl and J. R. Miner (*Maine Sta. Bul. 279 (1919), pp. 57–64*).—This is an abstract of the paper noted above. The discussion of yield as a function of age is given with but little change from the original except the absence of graphs, but the treatment of variation is much condensed.

Pure-bred sires effect herd improvement, M. N. Lawritson, J. W. Hendrickson, and W. B. Nevens (*Nebraska Sta. Circ. 8 (1919), pp. 3–15, figs. 7*).—The milk and butter fat produced by 12 daughters of a Jersey bull and by 9 of two Holstein bulls during their first, and in most cases, their second lactation are tabulated individually. Each cow's record is compared directly with the corresponding record of her dam. The Jersey daughters in their first lactation averaged 118 lbs. more butter fat than their dams, while the increases in the case of the two groups of Holstein daughters were 262 and 142 lbs., respectively. Similar increases were observed in the second lactation, as well as substantial improvement in milk yields of both lactations.

Breed and size of cows as factors affecting the economy of milk production, W. B. Nevens (*Jour. Dairy Sci., 2 (1919), No. 2, pp. 99–107, figs. 3*).—The records of the Wisconsin Dairy Cow Competition (E. S. R., 28, p. 272) are arranged in tabular and graphical form to show that the heavier cows of a breed produce more milk, fat, and total solids per feed unit than the lighter cows, and that the Holstein produces more milk and less fat per feed unit than the Jersey and Guernsey breeds.

Some correlations in the cost of milk production, J. A. Hopkins, jr. (*Jour. Dairy Sci., 2 (1919), Nos. 2, pp. 63–98, figs. 12; 3, pp. 208–255, figs. 15*).—The author arranges and classifies the data secured by him in the course of a field survey of 87 dairy farms (14 of them operated by tenants) in northern Delaware and southeastern Pennsylvania, to illustrate the relation of the following factors to economy of milk production: Amount and cost of labor, amount of grain fed, proportion of concentrates purchased, amount of silage, amount of other roughage, valuation of cows (considered as grades), tenancy, production per cow, and cost of a quart of milk. Size of herd as a factor has been treated by the author in Delaware Station Bulletin 118 (E. S. R., 38, p. 777) using the same data. Throughout the paper the farms are divided into three classes according to the number of cows. In the treatment of a particular factor each of these classes is again divided into several (usually three) subclasses according to the magnitude of the factor in question. There are 83 such subclasses dealt with. The material is arranged in tabular and graphical form.

Maximum returns were found when a medium amount of man labor (165 to 170 hours per cow) was expended in a year. The proportion of purchased feed had no uniform effect on the cost of production. Tenant farmers purchased a smaller proportion of their feeds than the owners. The extensive purchasers of grain were mostly the dairies of medium size, a group which used labor sparingly.

With an increase in the use of concentrates there was a decrease in the amount of milk produced per unit of grain, but generally an increase in the total yield per cow. Apparently there was much inefficiency in the adjustment of feeds to productive capacity. In the smaller herds there was a tendency to use much corn stover and little grain. No silage was fed on 28 farms, all of them with small herds or farmed by tenants. Higher production was associated with increased use of silage, but the cost per quart was also increased since more grain, more labor, and less pasturage were used. Farms with silos sold milk at a higher price and possessed cows of higher value.

"Except in the case of dairies producing the higher grades of milk, there is a tendency for the dairymen owning the most valuable cows to accept lower prices for their products than those owning cows of medium value. This is a result of a greater interest among these farmers in the care of their cows than in the profit from them." In spite of unbusinesslike marketing methods, however, these farmers sold milk at a greater profit per quart than the owners of cheaper cows because production was higher. Dairies where production was costly often secured a higher price for their milk than did those run more efficiently. Apparently operators who felt they were losing money sought out buyers willing to pay the most.

Feeding dairy cows in California, F. W. Woll (*California Sta. Circ. 215 (1919), p. 6*).—The percentages of digestible protein and of digestible carbohydrate plus fat in 40 feeding stuffs, said to be common in California, are listed to enable a farmer to determine whether a particular ration made up of such feeds conforms to the accepted feeding standards for milch cows.

Investigations with milking machines, F. W. Woll (*California Sta. Bul. 311 (1919), pp. 31–54, figs. 8*).—This is a study of the influence of machine milking on milk and butter fat production. In the course of the investigation 78 cows in the university herd were machine milked for periods ranging from a few weeks to three complete lactations. The four major dairy breeds were represented.

A study of the immediate effects of change in methods of milking was made by considering the yields in three successive 2-week periods, the change in milking taking place at the beginning of the second period. There were 31 records from 28 cows of change from machine to hand milking. The average milk yield of the second period was 27.4 lbs. less than the first; that of the third 24.2 lbs. less than the second. The drop in fat production averaged precisely the same in the third as in the second period, namely 1.33 lbs. In passing from machine to hand milking (18 records from 16 cows) there was an average decrease in the second period of 20.3 lbs. of milk and 0.69 lbs. of fat, and in the third period a decrease of 17.3 and 0.74 lbs., respectively. Because of the similarity between the decrease in the second and in the third period, the drop in the second period is attributed to advancing lactation and not to change in method of milking.

The records of 56 lactations where machine milking was practiced are compared with the same number of records from hand-milked cows. The former averaged 7,386 lbs. of milk and 283.6 lbs. of fat; the latter 7,800 lbs. of milk and 322.9 lbs. of fat. However, the average age of the machine-milked cows was 3 years 7 months, whereas that of the hand-milked ones was about 5 years. If the individual fat records of the young animals are increased according to the sliding age scale adopted in the two dairy cow competitions (E. S. R., 28, p. 272; 40, p. 375) that have been conducted by the author, so as to make the estimated yield at 5 years the basis of comparison, the average fat production of the machine-milked animals becomes 337.94±8.12 lbs., and that of the hand-milked ones 352.89±10.3. The difference, 14.95±13.1 lbs., because its probable error is relatively large, can not be attributed to differences in milking methods. The age corrections were made by adding 30 per cent to the observed production of heifers under 2.5 years at the start of lactation; 24 per cent to that of animals between 2.5 and 3 years old and progressively smaller percentages (18, 15, 8, and 5, respectively) for each 6 months' age increment.

Comparison of the yields in successive 4-week periods indicates that the decline in both milk and butter fat with advance of lactation is somewhat more gradual in machine-milked than in hand-milked cows.

A partial bibliography of milking machines is appended.

The numerical increase in bacterial count of milk from the pasteurizing vat to the consumer, R. S. Dearstyne (*Jour. Dairy Sci., 2 (1919), No. 2, pp. 133–141, fig. 1*).—From the records of the health department of the city of Baltimore the author summarizes by months the bacteriological counts of milk samples collected in the course of a year from dealers' wagons in the street, comparing each with the previous day's after-pasteurization count. Of 422 street samples, 199 showed increases in bacteria of over 500 per cent. In 45 cases the counts of delivered pasteurized milk were higher than the counts of the unpasteurized product. The greatest percentage increases occurred in July, but there was a secondary maximum almost as large in September.

An experiment is also reported which indicates that bottled milk given contact refrigeration by being iced in an insulated collecting case could be kept 20 hours at the dairy and then hauled over a delivery route for 4 hours without undergoing an increase in bacterial content.

The colon-aerogenes group of milk, O. W. Hunter (*Jour. Dairy Sci., 2 (1919), No. 2, pp. 108–129, figs. 2*).—This paper from the Kansas Experiment Station reports (1) the total bacterial content and the *Bacillus coli* content of 135 samples of market milk, (2) the colon content of 59 samples of milk when fresh, after holding at 60° and at 70° F for 24 hours, (3) the colon bacilli per gram in 15 samples of fresh cow feces, (4) the effect of the medium employed on colon enumeration, and (5) the classification of the colonies of the colon-aerogenes group isolated from milk feces.

The total counts appeared to be closely correlated with the *B. coli* counts. The *B. coli* were relatively few in number in fresh milk, but were greatly increased by holding at high temperatures.

Of 169 cultures isolated from feces, 95.2 per cent gave an acid reaction with methyl red, i. e., represented the fecal types of *B. coli*. Of 590 cultures isolated from milk, 66.2 per cent were acid forming. It is concluded that the colon groups in milk are derived chiefly from particles of manure.

Of the three enrichment media tested, asparagin broth had the least and bile lactose broth the greatest inhibiting effect on the growth of colon organisms. Endo broth was intermediate. All three media inhibited the growth of *B. coli communis*. *B. coli communior* was affected by Endo and by bile lactose, *B. acidi lactici* by asparagin and by bile lactose, and *B. lactis aerogenes* by bile lactose alone.

VETERINARY MEDICINE.

Annual report of the chief veterinary officer for the year 1918, S. Stockman (*Bd. Agr. and Fisheries [London], Ann. Rpt. Chief Vet. Off., 1918, pp. 12*).—The usual annual report (E. S. R., 40, p. 676).

Adjustment of reaction of culture mediums, E. A. Fennell and M. B. Fisher (*Jour. Infect. Diseases, 25 (1919), No. 6, pp. 444–451*).—Practical directions are given for determining the H-ion concentration of culture media by colorimetric methods, and the optimum and limiting reactions for the growth of various organisms in different media are discussed. The authors are of the opinion that "the adjustment of bacteriologic culture mediums according to hydrogen-ion concentration, because of its accuracy and simplicity, should wholly supplant the phenolphthalein (total acidity) method."

The preparation and preservation of serums and vaccines by desiccation in an absolute vacuum, F. BORDAS (*Compt. Rend. Acad. Sci.* [*Paris*], *169* (*1919*), *No. 15, pp. 670–672*).—The advantages are pointed out of preserving serums and vaccines by complete vacuum dehydration at a low temperature. If preserved in vacuum tubes the dried materials are said to retain their initial activity for several years whatever the atmospheric conditions may be.

The behavior of antibodies in various diluted and mixed immune sera, M. VON EISLER (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig.*, *83* (*1919*), *No. 2, pp. 182–192*).—By diluting tetanus antitoxic sera with salt solution and with heterologous goat or dog serum a loss in strength occurred, but little loss in antitoxin content was noted on mixing different samples of homologous antioxic sera. Similar experiments with agglutinating sera indicated that no marked loss in agglutinating strength occurred either in diluting the sera with homologous horse serum or with goat serum, or in mixing different immune sera of the same type. There was no loss in strength but in some cases an increase in hemolytic power on mixing hemolytic sera such as dog and sheep sera.

A study by the single-cell method of the influence of homologous antipneumococcic serum on the growth rate of pneumococcus, M. A. BARBER (*Jour. Expt. Med.*, *30* (*1919*), *No. 6, pp. 569–587*).—In this paper the results are reported of an investigation of the power of the serum of highly immunized horses to inhibit the growth rate of pneumococci. The single-cell method was used throughout, both in hanging drop and in test tube cultures.

Under all the conditions employed, pneumococci grew as readily in the serum of horses highly immunized to the homologous organism as they did in normal horse serum. This was true even when fresh rabbit blood, fresh human blood, or rabbit blister fluid was added to supply any complement that might be lacking, and when the immune horse serum was injected intravenously into rabbits or intraperitoneally into mice.

"The immunizing and protective power of antipneumococcic serum probably depends, in part at least, on properties which are not at present known. It has not been possible in the present study to demonstrate that one of these properties consists in delaying the growth of pneumococci."

Antiblastic phenomena in active acquired immunity and in natural immunity to pneumococcus, M. A. BARBER (*Jour. Expt. Med.*, *30* (*1919*), *No. 6, pp. 589–596*).—Continuing the investigation noted above of the factors involved in immunity to pneumococcus, a series of experiments was undertaken to determine whether or not blood or plasma fresh from the immune horse has any effect on the growth rate of pneumococcus. The single-cell method of study employed in the previous investigation was again used.

From the experiments reported, it was concluded that "whole fresh blood, coagulated plasma, or serum of the immunized horse added directly to pneumococci, has considerable inhibiting action on the growth of pneumococci. The inhibiting effect of the fresh blood, coagulated plasma, or serum of a normal horse, however, is as marked as that of a horse highly immunized to pneumococci of the same type. This property, therefore, does not seem to be of importance in acquired immunity in the horse. No such property has been demonstrated in whole fresh rabbit blood.

"It has been impossible to demonstrate that antiblastic phenomena play any part in natural immunity to pneumococcus, at least as far as the immunity of the pigeon is concerned. The whole fresh blood of the pigeon under the conditions employed exhibits no inhibiting action on the growth rate of pneumococci."

A résumé of some experimental studies on cutaneous hypersensitiveness, E. C. FLEISCHNER, K. F. MEYER, and E. B. SHAW (*Amer. Jour. Diseases Children, 18 (1919), No. 6, pp. 577–590*).—The authors summarize the work of other investigators concerning cutaneous hypersensitiveness and report two series of experiments, the first having for its object a study of the relationship of cutaneous hypersensitiveness to anaphylaxis, immunity, and infection, and the second a study of the pathogenicity of *Bacillus melitensis* for guinea pigs and its relationship to *B. abortus bovinus.*

In the first investigation guinea pigs were immunized intensively by the repeated injection of various antigens, immunity being determined by agglutination reactions. Intradermal tests were made upon these animals, certain of which were then selected for anaphylactic reactions. After a considerable time some of the guinea pigs were infected with living organisms corresponding to the antigens with which they had been previously immunized, and again cutaneous hypersensitiveness and anaphylaxis were studied.

In the second investigation the infecting organisms were injected into guinea pigs by the intraperitoneal and intratesticular routes. On the twenty-fifth day and again on the fifty-fifth day after the injection cutaneous hypersensitiveness was studied, using as antigens melitensin, abortin, bronchisepticin, and typhoidin. Agglutination tests were made, using *B. abortus bovinus* and *B. melitensis* for comparison. The animals were then killed and examined. One experiment with monkeys was also reported. The conclusions drawn from the studies are as follows:

"Cutaneous hypersensitiveness in guinea pigs that have been inoculated with *B. tuberculosis*, *B. abortus bovinus*, *B. melitensis*, or rodent paratyphoid is only positive in the presence of infection. Following intravenous injection of living typhoid bacilli, temporary cutaneous hypersensitiveness can be produced frequently. Guinea pigs showing a high grade of acquired immunity to an organism, as evidenced by a strongly positive agglutination, complement fixation reactions, and complete resistance to a subsequent infection with living organisms, will never give specific positive cutaneous hypersensitiveness. Bacterial proteins, soluble or insoluble, which sensitize a guinea pig in an anaphylactic sense, will not sensitize its skin. A state of an anaphylactic hypersensitiveness can exist without the least cutaneous hypersensitiveness.

"The *B. abortus* and *B. melitensis* are very closely related. Guinea pigs infected by the *B. abortus* give just as strong a skin reaction with melitensin as do guinea pigs infected with certain strains of *B. melitensis.* From the standpoint of bacterial protein sensitization, the relationship of these two organisms is closer than the one generally recognized between the *B. typhosus* and *B. paratyphosus.* It is not unlikely that the *B. melitensis* is the caprine strain of the bovine *B. abortus.*"

Blackleg and its control, L. W. GOSS (*Kansas Sta. Circ. 75 (1919), pp. 4*).—This circular describes briefly the occurrence, symptoms, and treatment of blackleg, and its prevention by the use of blackleg aggressin (E. S. R., 38, p. 686) and the blackleg filtrate described by Eichhorn (E. S. R., 37, p. 689). It is stated that from July 1, 1918, to June 30, 1919, 39,880 doses of blackleg filtrate were sent out by the college, and that during that time no loss from blackleg was reported of any animal which had been vaccinated with the blackleg filtrate.

The author considers it advisable to discontinue the use of the powder or pill vaccines and use the blackleg aggressin or filtrate instead, in doses of

5 cc., regardless of the size of the animal. Calves in badly infected pastures should be treated as young as 3 or 4 weeks of age, and the treatment repeated when 5 to 8 months old.

The occurrence of dourine (slapziekte) in South Africa, J. Walker (*Rpts. Dir. Vet. Research, Union So. Africa, 5–6* (*1918*), *pp. 187–206*).—The author records the demonstration of the occurrence of slapziekte or dourine in Southwest Africa. The evidence available indicates that it existed there prior to the commencement of the German southwest campaign, but the manner in which it was introduced has not been definitely ascertained.

The differential diagnosis of glanders, W. Pfeiler (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig., 83* (*1919*), *No. 2, pp. 168–171*).—The author describes a pathological condition in horses very similar in the lesions produced to glanders, but which is caused by a bacillus differing slightly from *Bacillus mallei*. This bacillus has the power of agglutinating the serum of glandered horses, and horses with acquired immunity to the new disease have been found to have a strong immunity against glanders. It is hoped that the discovery of this organism may furnish a means for the successful immunization of horses against glanders.

Note relative to the treatment of ulcerous and epizootic lymphangitis, A. Delmer (*Rec. Méd. Vét., 95* (*1919*), *No. 15–17, pp. 452–459, fig. 1*).—Brief directions are given for the local treatment of lymphangitis.

On the migrating course of ascarid larvæ in the body of the host, S. Yoshida (*Jour. Parasitol., 6* (*1919*), *No. 1, pp. 19–27*).—In continuation of the investigations previously noted (E. S. R., 41, p. 286), experiments with guinea pigs are reported in which (1) the larvæ were injected into the abdominal cavity and into the pleural cavity and (2) mature eggs were fed.

The author concludes that, while some of the larvæ in the abdominal cavity might have reached the lungs by passing through the liver and heart by the way of a blood vessel, the majority of them proceeded directly to the lungs by piercing the diaphragm. The feeding experiments apparently confirmed this conclusion, it appearing that the larvæ which hatched out in the intestine immediately pierced the intestinal wall and entered the abdominal cavity. Those injected into the pleural cavity enter the lungs direct. The author reports that he has frequently found the larvæ not only in the spleen, as previously recognized by Ransom and Foster (E. S. R., 38, p. 385), but also in the pancreas and kidneys.

Notes on the species of Gastrophilus found in South Africa, G. A. H. Bedford (*Rpts. Dir. Vet. Research, Union So. Africa, 5–6* (*1918*), *pp. 625–648, figs. 17*).—These notes relate to three species found in South Africa, namely, *G. intestinalis* (*equi*), *G. pecorum*, and *G. nasalis*. Of these *G. intestinalis* is the most common, but the other two are far from being uncommon. The effects of the larvæ upon their hosts are dealt with under the headings of (1) in the duodenum, cardiac, and fundus; (2) in the pharynx and attached to the epiglottis; (3) in the esophagus; and (4) attached to the rectum.

Notes on the intoxication by Gastrophilus larvæ, G. van de W. de Kock (*Rpts. Dir. Vet. Research, Union So. Africa, 5–6* (*1918*), *pp. 649–694, figs. 2*).—"Gastrophilus larvæ contain a toxin, which produces definite symptoms of intoxication, etc., when extracted and injected subcutaneously, intrajugularly, and by drenching into horses, and injected intrajugularly into mules, donkeys, sheep, and goats. The horse seems to be the most susceptible to the toxin, but even here there is a varying degree of susceptibility. The toxin of the Gastrophilus larvæ when extracted passes through a Berkefeld filter. No symptoms of an intoxication were observed in cattle, dogs, rabbits, and guinea pigs; the symptoms, etc., observed in rabbits being due to infectious germs injected with the nonsterile watery extracts.

"In view of our present knowledge on anaphylaxis there does not seem to be sufficient evidence on hand to explain the symptoms, etc., observed in horses, etc., on the lines of an anaphylaxis.

"There does not seem to be a relative difference in the toxicity of the extracts made from the three different species of larvæ which occur in South Africa, namely, *Gastrophilus nasalis*, *G. equi*, and *G. pecorum*. About 80 per cent of the horses that died of disease other than pernicious anemia showed the presence of Gastrophilus larvæ, and aneurism of the anterior mesenteric artery.

"Watery extracts of Gastrophilus larvæ taken from horses that died of diseases other than pernicious anemia can not produce pernicious anemia when injected into susceptible horses. Watery extracts and filtrates (through a Berkefeld filter) of Gastrophilus larvæ taken from horses dead of pernicious anemia can produce the disease when injected into susceptible horses. Watery extracts of Gastrophilus taken from horses dead of horse sickness can produce horse sickness when injected into susceptible horses.

"Of four susceptible horses injected with the filtrate (through a Berkefeld filter) of Gastrophilus larvæ taken from horses that died of horse sickness none contracted horse sickness."

The effects of arsenite of soda dipping fluids on working oxen, D. T. MITCHELL (*Rpts. Dir. Vet. Research, Union So. Africa, 5–6 (1918), pp. 551–591*).—The experiments reported show that when "given a tank with a sufficiently long swim and dipping at 5-day intervals it is possible to prevent tick infestation with a dipping fluid containing a much lower percentage than the standard 0.16 per cent, and that a dipping fluid containing 0.128 per cent arsenic, while possessing sufficient poisonous properties to prevent tick infestation, is the maximum strength which can be used on oxen without producing a degree of respiratory distress incompatible with good work."

Isolation and description of a bacterium causing oxidation of arsenite to arsenate in cattle dipping baths, H. H. GREEN (*Rpts. Dir. Vet. Research, Union So. Africa, 5–6 (1918), pp. 593–610*).—"An organism has been isolated from an arsenical dipping bath which oxidizes sodium arsenite to sodium arsenate with great vigor, even in mineral media containing only very small amounts of organic matter. It has also been detected in mixed cattle and horse feces. It is the causal organism of deterioration in arsenical cattle dips, and so far as has been ascertained by limited observation of a few tanks it is the only one to which rapid deterioration is to be ascribed.

Its dimensions are variable, usually 1 to 3 μ in length and 0.3 to 0.6 μ in breadth, slender rods predominating. Involution forms are larger and vary considerably in size and shape. It stains well with all ordinary stains, shows a beaded structure or bipolar staining, and is Gram negative. It is described as nonmotile, but motile forms which readily lose their motility have been observed. It has been named *Bacterium arsenoxydans*, and would have the group number 212.3331033 in the classification system of the American Society of Bacteriologists.

"Apart from its denitrifying activity and its power to oxidize arsenite to arsenate, its characteristics are rather negative. Apart from the negative characters indicated by the group number, it does not ammonify bouillon, nor produce alkalinity in milk media, produces neither indol nor sulphuretted hydrogen, nor any characteristic odor in bouillon. It grows either poorly or not at all in synthetic media such as Uschinsky's, Giltay's, or Cohn's. Growth on agar is slow, but in the course of a week is good; gelatin, poor and may fail;

on alkalinized potato, slow and uncertain, but may be good; in organic bouillon, media such as peptone, hay infusion, is good but slow. Plate cultures on agar and agar slopes are not unlike those of *coli*, except that the growth is slower and more compact.

"It is differentiated from most of the commoner organisms by its high tolerance for arsenite and its capacity to oxidize this to arsenate. The limit of tolerance is about 1 per cent As_2O_3, and oxidation can proceed slowly in concentrations as high as 0.8 per cent. The rate of oxidation under suitable conditions of air supply and reaction increases as the concentration of arsenite decreases. At 0.2 per cent As_2O_3, oxidation, after moderate inoculation into suitable media, may be complete in five or six days. Oxidation proceeds best in a faintly alkaline medium, being inhibited by very slight acidity, and rapidly coming to a standstill in neutral media unless the buffer effect is sufficient to absorb the change of H-ion concentration accompanying the transformation of alkaline arsenite into neutral or acid arsenate. The reaction limits are approximately assessed as pH 6.8 to pH 10 or perhaps pH 6.6 to pH 10.5.

"Although the organism does not grow under anaerobic conditions in bouillon, growth readily occurs in presence of nitrate. Arsenate can not take the place of nitrate, i. e., although arsenite is vigorously oxidized to arsenate under aerobic conditions the reverse change of reduction is not effected under anaerobic conditions."

Description of a bacterium, isolated from a cattle diping tank, which reduces arsenate to arsenite, H. H. GREEN (*Rpts. Dir. Vet. Research, Union So. Africa, 5–6 (1918), pp. 611–624*).—"An organism which reduces sodium arsenate to sodium arsenite with great rapidity, and is capable of tolerating high concentrations of arsenite, has been isolated from an arsenical dipping tank. Its original source is probably fecal. It is the organism responsible for counteracting the oxidation which may be brought about by *Bacterium arsenoxydans* . . . and so far as is known at present it is the only one of practical importance in this direction.

"It is a vigorously motile, nonsporulating organism, usually with 4 to 8 flagella, but on occasion it may lose its motility and be cultivated for two or three generations as a nonmotile bacterium. Its morphology, cultural behavior, and general biochemical characteristics bring it into the typhosus subdivision of the colon-typhoid group. According to the classification system of the American Society of Bacteriologists, it would have the group number 222.2333033, the facultative character not being very pronounced and a marked preference for aerobic conditions being shown. Since no other member of the colon-typhoid group which we have had an opportunity of examining displays either the degree of resistance to arsenite or the marked ability to reduce arsenate, shown by this organism, it is considered that provisional christening is justified, and the name *B. arsenreducens* is suggested.

"The organism is rod-shaped with rounded ends, and somewhat variable in size. Dimensions may range from 1 to 6μ in length and 0.3 to 0.6μ in breadth, the typical form being about 2 by 0.4μ. Tendency to chain formation is marked. It stains well with all ordinary dyes and is Gram negative. Apart from the characteristics indicated by the group number it sometimes inclines more to the *coli* end of its group, as in sulphuretted hydrogen production, type and vigor of growth on potato and other solid media, and sometimes inclines more to the *typhosus* end as in absence of indol production and behavior in milk media, and we should not be surprised if a strain were obtained in which acid production was lacking. Such a strain would merely represent a shifting of the characteristics further away from the *coli* end of the group toward the *alcaligenes* end.

"In the ordinary sense it is nonpathogenic for rabbits and guinea pigs; probably also for man.

"Its outstanding characteristic is its high tolerance for arsenite and its capacity to reduce arsenate very rapidly in presence of sufficent organic matter. This it can do in both acid and alkaline media, a neutral or faintly alkaline reaction being most favorable. The reaction limits for growth are roughly assessed as lying between pH 4.5 and pH 10.5. The actual extent of reduction of arsenate varies with the composition of the medium and with its buffer effect; is greater, for instance, in glucose bouillon than in ordinary bouillon. The tolerance for arsenite in bouillon corresponds to about 1.2 per cent As_2O_3', although perceptible retardation in growth is noticeable below 0.8 per cent. Reduction can proceed almost to the limit of tolerance for arsenite, provided no other limiting factors are at work."

The influence of the composition of the medium upon reduction is discussed briefly in relation to reduction and oxidation under practical conditions in dipping tanks in the field.

Experiments with emulsions for protecting camels against the attacks of bloodsucking flies, H. E. Cross (*Agr. Research Inst. Pusa Bul. 76 (1917), pp. 11*).—Of the preparations used the only one which prevented tabanids from attacking for any length of time was castor oil, the use of which on account of its cost can not be recommended.

Mexican red fever of swine and its preventive vaccination, E. López Vallejo (*Mem. y Rev. Soc. Cient. "Antonio Alzate," 38 (1919), No. 5–8, pp. 277–289, pls. 2, figs. 4*).—This paper contains a description of the symptoms of swine erysipelas, a summary of the microscopic, cultural, and biochemical characteristics of the causative microorganism, and an account of the methods employed in securing immunization against the disease, which consist chiefly of inoculating the animal with attenuated cultures of the bacillus.

Studies on fowl cholera.—VI, Immunization against Bacillus avisepticus by means of inoculations with killed cultures of virulent and avirulent strains, P. Hadley and D. W. Caldwell (*Rhode Island Sta. Bul. 179 (1919), pp. 4–15*).—In continuation of the studies on fowl cholera previously noted (E. S. R., 39, p. 892), this publication "presents the results of attempts to immunize rabbits and fowls against infection with a virulent strain of *B. avisepticus*, by means of injections of cultures killed by heating. The results show (1) that injection with cultures of an avirulent strain (52) produced more satisfactory results in rabbits and less satisfactory results in fowls than did treatment witth cultures of the virulent strain (48); (2) that, in the case of rabbits, the individuals that received the maximum number of inoculations, or the maximum dosage, were best protected; (3) that, in the case of fowls, those individuals that received the protective inoculations subcutaneously were slightly better protected than those that received treatment by the intraperitoneal route; (4) that even though the inoculation with killed cultures of the avirulent or virulent type may not invariably produce immunity, such protective inoculations may produce an increased resistance to infection which manifests itself by delaying the fatal termination."

These results are also considered to corroborate the evidence previously presented that cultures of *B. avisepticus* are nontoxic, and owe their disease-producing power to other factors than either endocellular or extracellular toxins.

Poultry diseases, L. D. Bushnell and J. G. Jackley (*Kansas Sta. Circ. 70 (1918), pp. 21, fig. 1*).—A summary of information on the nature, prevention, and control of diseases and parasites of poultry.

RURAL ENGINEERING.

Winter irrigation for western Kansas, G. S. KNAPP (*Kansas Sta. Circ. 72 (1919), pp. 3–8, figs. 4*).—This circular discusses the more important results of experiments on winter irrigation at the Garden City substation, and states that whenever winter irrigation can be successfully carried on in western Kansas it is to be recommended.

Five years' experiments showed that sufficient water can be stored in the soil by winter irrigation alone to produce good crops of corn, Kafir corn, milo maize, and certain other row crops. The soil on which these experiments were made is a deep silt loam, representative of most of the upland in the western part of the State. Good yields have been obtained each year with all crops grown on the winter-irrigated land. At the same time, with the exception of the wet season of 1915, unirrigated land produced practically nothing.

Other noteworthy advantages of winter irrigation are that "water applied during the winter months has more time to penetrate into the soil, and consequently penetrates to a greater depth than if applied during the growing season. This serves to deepen the zone in which the plants can feed. . . . Much more plant food is liberated where the water has had time to saturate the soil thoroughly. . . . Thawing and freezing greatly improve the texture of the soil. . . . Therefore, soil that has been irrigated in the fall and is wet through the winter will be in a better physical condition in the spring than dry soil.

"Often water applied to a growing crop, especially one suffering for water, will produce excessive vegetative growth when the crop should be making grain. Or it may cause the plants to start a new growth and greatly delay maturing. If the crop were able to extend its root system for food and moisture, as might be the case on winter-irrigated land, a more normal growth would be produced and earlier maturing result."

Hydraulic experiments with valves, orifices, hose, nozzles, and orifice buckets, A. N. TALBOT ET AL. (*Univ. Ill., Engin. Expt. Sta. Bul. 105 (1918), pp. 80, figs. 28*).—This bulletin is in four parts:

Part I, by A. N. Talbot and F. B. Seely, presents the results of experiments on the flow of water through 1-in. and 2-in. gate valves, 1-in. and 2-in. globe valves, and 1-in. and 2-in. angle valves. The loss of head caused by each valve, expressed in terms of the velocity head in the pipe, is given for four different ratios of the height of the valve opening to the diameter of the full valve orifice, namely, ¼, ½, ¾, and 1. The coefficients of discharge are also given for the gate valves for each of the four valve openings.

It was found that "the loss of head caused by small valves varies as the square of the velocity in the pipe for all the valve openings; hence the lost head may be expressed as a constant times the velocity head in the pipe, $(h=\frac{mv^2}{2g})$. When wide open a globe valve causes more than twice as much loss of head as an angle valve of the same size, while a gate valve causes much less loss of head than either a globe or an angle valve, the velocity in the pipe being the same in the three cases. The loss of head for an angle valve is somewhat less when about three-fourths open than when wide open, the velocity in the pipe being the same in each case. The loss of head for each valve, as the valve is closed from a wide open position, varies comparatively little with the valve opening until the valve is at least one-half closed. As further closure takes place the loss of head of the globe valves and gate valves increases rapidly, and is considerably larger than that of the angle valves.

"The form or shape of the passageways through a globe or angle valve has a large influence on the loss of head for the small valve openings. The portion of the passageways in which the form seems of greatest importance is in the exit from the valve rather than in the passageways leading to the valve disc or seat. On account of the influence of the form or shape of the valve no law giving the relation of the lost head to the diameter of the valve can be stated for valve settings less than five-eighths open. For larger valve openings than this, the lost head seems to vary approximately inversely as the diameter. The use of the lost head through a partially closed valve as a means of determining the flow can be only a very rough method of measurement unless the particular valve to be used is calibrated under service conditions. Even then the difficulty in obtaining the desired valve setting may introduce considerable uncertainty in the results."

Part II, by F. B. Seely, presents the results of experiments on submerged sharp-edged orifices of various shapes and sizes discharging under moderately low and under very low heads. The orifices used were of three shapes, circular orifices with diameters from 1 in. to 6 in., square orifices with sides from 0.5 in. to 5.5 in., and rectangular orifices having one side range from 0.5 in. to 2 in., the other side being 6 in. in each case. The coefficient of discharge is given for each orifice for a velocity range of approximately 0.5 ft. per second to 4 ft. per second. This range corresponds roughly to a range of head on the orifice of 0.006 ft. to 0.08 ft.

It was found that the coefficient of discharge for a circular, a square, or a rectangular submerged orifice does not vary with the velocity. Circular and square submerged orifices having areas greater than about 10 sq. in. have a common coefficient of discharge varying but little from 0.6. Rectangular submerged orifices having one side from 3 to 12 times the other side have a constant coefficient of discharge which is larger than that for circular and square orifices of the same size, particularly for the larger areas, at least up to a size of 12 sq. in. The flow of water through submerged sharp-edged orifices is very nearly the same as that for the same kind of orifices with discharge into air, provided the head is not less than 2 or 3 diameters when the discharge is into air.

Part III, by V. R. Fleming, presents the results of experiments on 1.5 in. hose and nozzles. Both rubber-lined hose and unlined linen hose were used. Three sizes of conical nozzles were tested, the diameters of the nozzle openings being $\frac{5}{16}$, $\frac{7}{16}$, and $\frac{1}{2}$ in. The loss of head in the hose due to friction and the corresponding friction factor are given for each hose for a range in velocity from about 4 to 8 ft. per second. The coefficient of discharge for each nozzle is recorded for a range in pressure at the base of the nozzle from about 10 to 85 lbs. per square inch. The height and horizontal distance which the jets reached are also recorded.

It was found that the friction factor (f in the equation for the lost head, $h=f\frac{lv^2}{d2g}$) for rubber-lined hose varies but little with the velocity in the hose, and is nearly the same as for clean iron pipe of the same diameter. "The friction factor for unlined linen hose decreases as the velocity increases. In general the loss of head in unlined linen hose is about twice as great as in rubber-lined hose of the same diameter and for the same velocity.

"The nozzle should have a smooth cylindrical tip at least 0.5 in. long to keep the jet from spraying. A cylindrical tip is a much more important factor in securing a good fire stream than a smooth surface in the interior of the nozzle. Nozzle openings commonly in use to supply fire streams in the interior of buildings seem too small for adequate temporary fire protection. It is recommended that a nozzle with a 0.5 in. opening be used with a 1.5 in. hose in order to secure a sufficient quantity of water for an effective fire stream. The coefficient of discharge of a small conical nozzle varies but little with the velocity and is close to 0.98. The value of 0.95 obtained with the $\frac{5}{16}$-in. nozzle, which was 12 in. long as compared with 6 in. for the other nozzles tested, indicates, however, that the nozzle should be short to obtain the value of 0.98. A cylindrical tip on the nozzle seems to have little influence on the coefficient of discharge."

Part IV, by M. L. Enger, describes a method of measuring water by means of a simple, portable, and inexpensive apparatus, and presents experimental data applying thereto.

Surface water supply of the United States, 1916, parts X, XIIA, XIIB (*U. S. Geol. Survey, Water-Supply Paper 440 (1919), pp. 331+XXXVIII, pls. 2; 442 (1919), pp. 203+LI, pls. 2; 443 (1919), pp. 186+LI, pls. 2*).—The first of these reports, prepared in cooperation with the States of Utah, Nevada, California, Oregon, and Wyoming, presents the results of measurements of flow made on streams in the Great Basin during the year ended September 30, 1916. The second, prepared in cooperation with the States of Washington, Montana, and Idaho, presents corresponding data for the Pacific slope basins in Washington and the upper Columbia River Basin, and the third, prepared in cooperation with the States of Oregon, Nevada, and Washington, with corresponding data for the Snake River Basin.

Water power on the farm, J. S. Fitz (*Trans. Amer. Soc. Agr. Engin., 12 (1918), pp. 88–96, figs. 8*).—This article, prepared at the Manitoba Agricultural College, deals with the general factors to be considered in the design of small water-power plants and describes several specific examples.

Ice on the farm, C. Larsen (*South Dakota Sta. Bul. 185 (1919), pp. 88–109, figs. 15*).—This bulletin reports several years' experiments on the freezing and storage of ice under farm conditions, and gives detailed drawings of successful ice freezing cans and ice storage houses.

It was found that in South Dakota ice may be successfully frozen in cans and that weather at zero or below is most favorable for this purpose. Such ice should be stored while at this low temperature, and keeps better than if allowed to lie until the weather moderates before it is stored. It was also found that the bulging of ice frozen in cans may be prevented by inserting certain devices such as rubber bladders or paraffined paper cartons to take up the expansion due to freezing. However, the bulging did not seriously affect the success of ice manufacture by the can method, and the prevention of bulging is not considered absolutely necessary. In general, cans of sheet iron of No. 22 gauge gave the best results.

In storage experiments, it was found that pit storage is considerably superior to storage above ground and that sawdust is a better packing material than straw. The loss during storage is usually about 60 per cent or more, and in only one case was as high as 47 per cent recovered for use.

The spacing and depth of laterals in Iowa underdrainage systems and the rate of runoff from them with data from investigations, W. J. Schlick (*Iowa Engin. Expt. Sta. Bul. 52 (1918), pp. 119, figs. 70*).—This bulletin reports investigations, the purpose of which was to collect such accurate and reliable information as to the operation of typical and special underdrainage systems as would lead to a more correct understanding of the effects of various spacings and depths of laterals upon the level of the ground water and the rate of runoff, and the correct design of Iowa underdrainage systems. The work done consisted in keeping records of the measurements of (1) the discharge from six underdrainage systems whose drainage areas ranged from 10.8 to 443 acres, (2) the fluctuations of the ground water level in five of these systems, and (3) the rainfall at or near each tract, and in studying these records to determine their application to typical Iowa conditions. The records were taken from 1908 to 1916, inclusive, and include at least two years' records from each system.

The records made show that for typical Iowa farm underdrainage systems the maximum rate of runoff following each rain or series of rains occurs at least within twelve hours, and usually within six hours, after the end of the severe portion of the storm. When the rain is at fairly heavy and steady rate for several hours the tile may reach the maximum rate of discharge before the end of the storm. This is especially to be expected during the spring when series of rains are common. The period required for the runoff to reach the maximum for the particular storm is worthy of much consideration in connection with the design of systems which are provided with intakes for admitting surface water. In large county drains the time required for the surface runoff to collect at the intake, and that required for a given particle of water to move through the drain, are such as to make it practically certain that the drain will often be receiving a large amount of surface runoff at the same time it is called upon to care for the maximum rate of underdrainage runoff.

These investigations indicate that, in the average loam soils of Iowa, laterals not to exceed 100 ft. apart will be required to accomplish the proper control of the ground water, and that the increase in crop production when laterals are not to exceed 75 ft. apart will probably make such a system economically desirable. In very rare cases underdrainage systems may be constructed in soils so open that laterals may be placed as much as 200 ft. apart. When the soils are close or where the underdrainage area is to be used for truck crops, it may be necessary to decrease the lateral spacing to 33 ft. or 50 ft. In the so-called "hardpan" areas in southern Iowa the maximum lateral spacing consistent with proper control of the ground water will seldom, if ever, exceed 60 to 75 ft.

"There seems to be no adequate reason why the average depth of all lateral systems should not be at least four feet. The only possible exception to this general statement is for underdrainage systems in the 'hardpan' areas.—Lateral systems 4 ft. deep in these soils will not remove the surplus moisture as rapidly during the first few years as will systems not so deep, but this soil will become more open as time goes on.—It is recommended that even in this soil no lateral systems be placed less than 3 or 3.5 ft. deep, and it is firmly believed that, when the results for the whole life of the drainage system are considered, it will be more economical to hold to the 4-ft. depth.

"It is obvious that a determination of the rate of runoff will depend largely upon the judgment of the engineer, but—the data—show that such a procedure is desirable, and that it is not logical to use a uniform rate of runoff as is now the all-too-common practice. The decision as to the rate of runoff from large county drains presents a more difficult problem. Obviously the runoff from such a system will be the summation of the flows from a number of farm lateral systems that are unplanned when the county drain is designed. In this case the engineer should use his knowledge of the topography and soil of the district, and the probable amounts of surface water admitted through intakes, in conjunction with his judgment as to the farm lateral systems which will be needed and which will eventually be installed, in arriving at his decision as to the rate of runoff for which the system should be designed. The results of these investigations indicate quite clearly that the use of a uniform rate of runoff is incorrect, and that the average value of ½ in., now quite commonly used, should be increased to $\frac{5}{8}$ or ¾ in."

Public Roads (*U. S. Dept. Agr., Public Roads, 2* (*1919*), *No. 16–17, pp. 36, figs. 32*).—This number of this periodical contains the following articles: Granite Block Construction, by J. L. Goldberg; Instrument for Measuring Wear of Concrete and Other Surfaces, by W. E. Rosengarten (see below); Constructing Pennsylvania Federal Aid Project No. 12; What Frost Does to Concrete; Big Road Projects Included in July and August Approvals; Bridge Approaches; New Method for Adjusting Earth Excavation and Determining Haul, by J. W. Ball and C. R. Shore (see below); and Comprehensive Investigations in Highway Engineering Needed, by T. R. Agg.

Instrument for measuring wear of concrete and other surfaces, W. E. ROSENGARTEN (*U. S. Dept. Agr., Public Roads, 2* (*1919*), *No. 16–17, p. 12, figs. 2*).—An instrument is described and illustrated, designed by the Bureau of Public Roads, which consists essentially of two bearing plates each 2 in. in diameter, pivoted on universal joints to a spanner 11.5 in. long. At the midpoint is mounted a micrometer, whose plunger has a travel of 1 in. and whose dial is graduated to read to 1/1,000 of an inch. A level bubble indicates when the plunger is vertical. In order to form a base to which measurements can be referred from year to year, brass plugs are set in the pavement where readings are desired. Readings are taken by resting the bearing plates on the road surface and allowing the spindle or plunger to rest on the base plane of the plug.

New method for adjusting earth excavation and determining haul, J. W. BALL and C. R. SHORE (*U. S. Dept. Agr., Public Roads, 2* (*1919*), *No. 16–17, pp. 27–34, figs. 14*).—This article describes a graphic method of adjusting excavation and determining overhaul by use of quantities and excess area diagrams.

Standardization of farm machinery, A. B. DINNEEN (*Trans. Amer. Soc. Agr. Engin., 12* (*1918*), *pp. 151–159*).—This is a review of the progress made in standardization and elimination of farm machinery since the United States entered the war.

Relation of large machine units to production, A. P. YERKES (*Trans. Amer. Soc. Agr. Engin., 12* (*1918*), *pp. 136–150, fig. 1*).—The author presents and analyzes data from different sources to show that while great progress has been made in the development of improved farm machines, much of this improved equipment is used on only a very small percentage of the farms even in sections where natural conditions are favorable to its use. "The greatest problem which to-day confronts the various organizations for the promotion of agriculture is that of having available improved equipment more fully utilized." "The principal justification for the adoption of improved farm machinery is a farm of sufficient size to utilize it efficently."

An analysis to distinguish between a crank and an eccentric as driving or driven elements, H. S. DICKINSON (*Trans. Amer. Soc. Agr. Engin., 12* (*1918*), *pp. 97–124, figs. 18*).—This in an intricate mathematical analysis of the action on each other of a crank and an eccentric on two different shafts in the same horizontal plane.

It is concluded that a crank can drive as well as be driven, and that an eccentric will drive fairly well as compared with a crank, but in no measure can it be driven as compared with a crank. In the case in question, it is considered that the ordinary value of friction would make it unsafe to utilize cranks as driving members to eccentrics. "Especially when the number of cranks is limited to two, it is evident that it would be impossible to employ cranks to drive eccentrics even under the most favorable conditions."

The Wichita tractor demonstration (*Gas Engine, 21 (1919), No. 9, p. 297*).—This article lists the 59 tractors demonstrated at the recent tractor demonstration at Wichita, Kans., and states that "the trend of tractor design, as shown by the exhibits, is toward the four-wheel type, and the advent of a small machine of the one-plow variety and a rating of 5–10 to 6–12 h.p. Gradually but surely the fifth-wheel is passing in favor of the steering knuckle. In fact, the whole tendency is toward the automobile type of construction. Accessibility is another feature that is receiving attention. Kerosene troubles seem to be passing, and the majority of the machines burned this fuel. Four-cylinder engines are largely in favor, while an occasional six-cylinder is to be seen.

"The fact that the tractor is adapted to other tasks than plowing and hauling is becoming recognized. In several instances the farm machinery, the mechanism of which is usually operated from the wheel, is arranged to derive its power directly from the engine on the tractor. This is accomplished by means of a flexible shaft. The plan eliminates the bull-wheel on the harvester, the chain drive on the manure spreader, and similar mechanisms of other machines."

The gasoline automobile: Its design and construction, P. M. Heldt (*Nyack, N. Y.: Author, 1916, vol. 1, 4. ed., pp. VI+603, pls. 24, figs. 382; 1917, vol. 2, 2. ed., pp. [IV]+602, figs. 423; 1918, vol. 3, pp. [IV]+410, figs. 319*).—This work consists of three volumes, as follows: I, *The gasoline motor*, dealing with the details of the theory, design, construction, and operation of internal combustion engines for use in motor propelled vehicles; II, *Transmission, running gear, and control*, dealing with the design, construction, and operation of the mechanical parts of the motor-propelled vehicle aside from the motor; and III, *Electrical equipment*, dealing with the electrical equipment of the motor-propelled vehicle, and giving a large amount of practical information on maintenance, care, and repair.

Plow bottom design, C. A. Bacon (*Trans. Amer. Soc. Agr. Engin., 12 (1918), pp. 26–42, figs. 10*).—In dealing with the question of plow bottom design, it is pointed out that the shape of the moldboard is not the only factor governing proper scouring, and that it is therefore necessary to design the moldboard to a shape so that it interferes a minimum amount with the crumbling of sticky soils. The chief causes of failure of moldboards to scour are considered to be soft spots, inequalities and depressions in the moldboard, and the condition of the soil, so that the material from which a plow bottom is made affects scouring as much as shape. Comparative tests of a chilled-metal plow and a steel plow in hard, gritty soils showed that the steel share lasted only 8 hours while the chilled share lasted 51 hours. The greatest amount of wear took place on the underside of the point of both shares.

Experiments were conducted, in a clay soil saturated with water, on the passage of earth over moldboards, with four types of bottom made for widely varying soil conditions. With a moldboard designed for sticky soils, there was very little pulverization and the furrow slice of clay soil was turned over without disturbance of soil particles. With a plow designed for sandy soils, the clay soil was broken into large clods. With a medium moldboard designed to plow a loamy type of soil, it was found that the furrow slice was turned on edge so that part of it rested on the furrow bottom and part on the top of the moldboard. "There is enough evidence to show that while the bottom is more particularly adapted to this soil than either of the preceding bottoms, yet it is not entirely satisfactory.

"A type of bottom particularly adapted for a clay soil was used in the last experiment. This bottom forces the turned furrow slice farther forward against the earth, and puts more pressure on it with the moldboard, which has a crushing effect. This crushing, grinding motion, where one part of the earth works right against the other, results in the pulverization of the soil. The moldboard, too, is longer than ordinary—a feature which adds to the strong pulverizing characteristics of this bottom. Naturally that kind of a plow is going to pull harder than one that breaks the soil into clods."

Further experiments with the four types of plows on one soil showed that the difference in the quality of the work done with the poorest plow and the best plow was very marked. The latter plow pulled 14 per cent heavier than the former.

A study of the plow bottom and its action upon the furrow slice, E. A. WHITE (*Trans. Amer. Soc. Agr. Engin., 12 (1918), pp. 42–50, figs. 13*).—This is a review of a paper previously noted (E. S. R., 38, p. 791).

Work of cultivation M. RINGELMANN (*Jour. Agr. Prat., n. ser., 31 (1918), No. 4, pp. 66–69, figs. 5*).—Data are summarized from different investigations showing that on a tertiary clay soil about eight times as much energy was required for preparing the soil for beets following cereals as for winter wheat following beets. Under better cultural conditions it was found that this ratio could be reduced to five.

The energy required for the preparation of soil for winter wheat following beets was 8,100,000 kilogram-meters per hectare, for beets following cereals 39,400,000, for spring oats 16,300,000, and for winter cereal following lucerne 17,200,000 kilogram-meters per hectare. It required an average total of 19.5 hours per hectare for preparing soil for winter wheat following beets, and 94.9 hours for preparing soil for beets following cereals.

Modern developments and practical details in the preservative treatment of wood, K. C. BARTH (*Trans. Amer. Soc. Agr. Engin., 12 (1918), pp. 75–87, figs. 5*).—This is a brief discussion of pressure and nonpressure processes for the preservative treatment of timber, and is accompanied by a standard specification for refined coal tar creosote and recommendations for application of nonpressure treatment.

Creosoting fence posts, H. W. BARRE (*South Carolina Sta. Bul. 201 (1919), pp. 13, figs. 2*).—The results of 10 years' experiments on the comparative value of some of the more promising methods of preserving farm timbers are reported.

It was found that, of the methods of treatment employed, the open tank treatment proved best. Most satisfactory results were obtained by using two tanks, one for hot creosote and one for cold. In this case the best impregnation was obtained by allowing the posts to remain in the hot creosote for from 2 to 3 hours and in the cold creosote for about 3 hours. The most satisfactory temperature for the creosote in the hot bath was 220° F. and for the cold bath 120°. When only one tank was used, it was found best to keep the creosote at 220° for 3 hours after the posts were put in and then allow the tank to remain unheated for 3 hours while the creosote cooled. Best results were obtained by standing the butts of the posts in the hot oil to the depth they are to go into the ground and then immersing the entire post in the cold oil; or, where a single tank was used, by allowing posts to stand in the creosote at this depth until about an hour after it had started to cool and then turning them down for the balance of the cooling period. The brush treatment with creosote, while not so good as the tank treatment, more than doubled the life of pine posts.

"Round pine and oak posts made from young trees 6 or 8 in. in diameter, when well seasoned and thoroughly impregnated with creosote, will last for longer than 10 years. Black gum, sweet gum, hickory, and poplar posts are not so durable when treated with creosote as are pine and oak posts. Untreated pine posts last from 1 to 4 years. Round posts when properly seasoned are more durable than split or sawed posts of the same species. This is due to the fact that the creosote penetrates the round posts better and more evenly than it does the split or sawed posts. Small posts when treated with creosote are better than large posts. They absorb the creosote better and last longer. As a preparation for treatment, all posts must be peeled, having the inner white bark as well as the outer rough bark all removed, and must be well seasoned. To season posts it takes about 8 weeks for pine and about 6 weeks, depending on the season, for other species."

Some stock ranch accessories, H. E. MURDOCK and H. WELCH (*Montana Sta. Circ. 84 (1919), pp. 85–100, figs. 15*).—This circular contains detailed drawings of articles of ranch equipment in general use and giving satisfaction. These include a corral gate, a chute and squeeze, a rectangular feed rack for cattle, a feed rack for sheep, an alfalfa feeding rack, a self-feeder for hogs, a cheap root cellar, and dipping vats.

Practical suggestions for the construction of liquid manure tanks (*Jour. Bd. Agr. [London], 26 (1919), No. 4, pp. 431–436, figs. 2*).—Plans and specifications for a liquid manure tank and accessories are given.

Barn roof design, J. L. STRAHAN (*Trans. Amer. Soc. Agr. Engin., 12 (1918), pp. 57–75, figs. 6*).—This is a study made at Cornell University of barn roof designs in general, and an analysis of the Shawver truss type in particular.

It is concluded that, as ordinarily constructed, the Shawver truss is not a true truss in the sense that it is truly rigid. In order to make it so, the lower roof rafter must be made an integral part and designed to withstand tensional stresses from vertical loadings and compressive stresses from wind load. This also applies in less degree to the upper roof member. "It is further very apparent that the purline post should always be heavier than the peak tie. They should ordinarily have relative strengths of 4 to 3."

Rural housing, J. A. W. GRANT (*Scot. Jour. Agr., 2 (1919), No. 3, pp. 369–374, fig. 1*).—This article outlines the important factors to be considered in the choice of sites and the selection of types of houses for rural districts, with special reference to conditions in Scotland.

As to sites it is considered desirable to erect houses in groups to increase the effective use of drainage and water supply conveniences. Health, convenience, and appearance are considered to be the important factors in house planning, and a sample plan is suggested.

Sanitation of rural workmen's areas (*Pub. Health Rpts. [U. S.], 33 (1918), No. 36, pp. IV+1477–1536, figs. 13, pls. 4*).—This report deals with water supply, sewage disposal, housing, and community planning for rural workmen, giving plans and specifications for structures.

Farm building ventilation, W. B. CLARKSON (*Trans. Amer. Soc. Agr. Engin., 12 (1918), pp. 51–57*).—This article consists mainly of an argument for the adoption of more highly specialized work on the subject of farm building ventilation.

The design, manufacture, operation, and care of lead storage batteries for farm lighting plants, H. M. BECK (*Trans. Amer. Soc. Agr. Engin., 12 (1918), pp. 187–207, figs. 17*).—This is a general discussion of the theory, development, construction, and operation of storage batteries with particular reference to their use in isolated plants.

With reference to types, it is stated that between the Plante and Pasted types "the cost per ampere hour discharge life is about equal, the Plante showing less than 10 per cent advantage. The cost per ampere hour capacity is about two to one in favor of the Pasted type. The Plante is more rugged, but is considerably heavier. The Pasted type is rugged enough, and has the advantage of lightness and compactness. This comparison shows up very decidedly in favor of the adoption of the Pasted type, and explains why this type is practically standard for this service."

RURAL ECONOMICS.

Forward in agriculture, G. I. CHRISTIE (*Banker-Farmer, 6 (1919), No. 5, pp. 8, 9*).—Addressing the conference of the Agricultural Commission of the American Bankers Association and committees on agriculture and education of the bankers' State associations with the U. S. Department of Agriculture and other national agencies, the author cites instances showing how investigation by the Department of Agriculture of expenses and net income on certain farms has enabled the operator to increase his operations by eliminating unprofitable items of his business. He emphasizes the interdependence of farmers and business men.

The farmer and finance, C. W. THOMPSON (*Banker-Farmer, 6 (1919), No. 5, pp. 16–19, figs. 2*).—Addressing the conference noted above on this topic, the speaker points out the extent to which banks carry farm mortgages and short-term farm loans, and the ways in which bankers are working for the improvement of agriculture.

Agriculture and the banker, D. F. HOUSTON (*Banker-Farmer, 6 (1919), No. 5, pp. 5, 6, fig. 1*).—This address has been noted from another source (E. S. R., 40, p. 890).

Farm plans for using borrowed capital (*Miss. Agr. Col. Ext. Bul. 10 (1919), pp. 27, figs. 5*).—In this bulletin are printed two plans for investing proposed loans from Féderal farm loan associations receiving first and second prizes offered by a banker in Memphis, Tenn., cooperating with the farm management department of the Mississippi College. Terms of the contest required of the men a map or sketch of the farm, a complete inventory of all farm property, a list of crops produced last year showing the number of acres, yield, amount sold, and price, a list of the income received from live stock or live-stock products, crop rotations followed in the past five years, a sketch of the fields showing where any clearing, fencing, tile draining, or other improvements were to be made, crop rotation to be followed for the next five years, and a list of improvements or purchases to be made and estimated cost of each; and of the women, a plan of the house locating the furniture, an inventory of the household goods, a budget of expenditures for last year for food, clothing, and shelter, a schedule of daily work, a proposed plan of the house, and a list of conveniences and furniture to be purchased.

Credit rating the farmer, I. WRIGHT (*Bul. Natl. Assoc. Credit Men, 21 (1919), No. 7, pp. 400–403; also in Cornell Countryman, 17 (1919), No. 1, pp. 7, 8*).—There is here proposed an organization along the lines of the farm bureau organization, the functions of which would be to install a standard system of records and accounting for farmers that would indicate the farmer's profit and loss, facilitate the figuring of his income tax, prove the worth as a credit risk of an individual farmer or farm organization, and lessen the expenses of bankers and business men in determining the farmer-customer's credit ability.

How to make and analyze an annual report for country grain elevators, F. Robotka (*Univ. Minn. Agr. Ext. Div. Spec. Bul. 42 (1919), pp. 14, fig. 1*).—This bulletin suggests a form for an annual report and ways of analysis of the information it should contain. The adoption of a uniform system of grain elevator accounting devised by the Bureau of Markets, U. S. Department of Agriculture, is urged.

Land and agricultural bank of South Africa, (*Union So. Africa, Land and Agr. Bank So. Africa, Rpt. 1918, pp. I+49*).—This report continues information previously noted (E. S. R., 39, p. 594).

Making the farm pay, C. C. Bowsfield (*Chicago: Forbes & Co., 1919, rev. ed., pp. 311*).—A general handbook of farm practices.

The influence of good farm organization in costs of production, W. F. Handschin (*Jour. Farm Econ., 1 (1919), No. 3, pp. 102–108*).—The author discusses briefly the physical organization of the farm, also the maintenance of the fertility of the soil, the most advantageous marketing of all crop material produced, the best utilization of the man and horse labor used, and the insurance against crop failures, price fluctuations, and other unfavorable conditions by means of a reasonable degree of diversity in producing both crops and animals as cost-of-production factors in profitable and permanent systems of farming.

The problem of land valuation in connection with a property tax in Austria, J. R. von Bauer (*Arb. Deut. Landw. Gesell. Österr., No. 2 (1918), pp. 72–84*).—This is a contribution to discussions of the property tax for Austria. Projects for raising the needed income by increasing existing taxes or inaugurating new ones, land tax legislation of foreign countries, and methods of valuation are discussed and compared. The author urges the appointment of a committee of inquiry, including some selected landowners.

Laws of Maine relating to agriculture (*[Augusta]: Dept. Agr., 1919, pp. 23*).—This gives the text of the laws relating to agriculture passed by the legislature in 1919.

Disposition of the public lands of the United States with particular reference to wage-earning labor, L. Magnusson (*Washington: U. S. Dept. Labor, 1919, pp. 30*).—This historical survey treats briefly of eight periods in the history of American land policy: (1) 1784–1801, contract sales by the Federal Government of large areas; (2) 1800–1820, period of credit sales in small lots; (3) 1820–1841, period of cash sales, usually in areas to suit purchasers; (4) 1841–1891, preemption system, or sale at low prices to individual settlers; (5) 1841–1871, land-grants period; (6) 1862 to date, homestead period; (7) 1880–1900, period of reforms; and (8) 1901 to date, conservation and reclamation period. Tables taken from the Yearbook of the U. S. Department of Agriculture for 1898, and from records of the General Land Office, respectively, show the disposition of the public domain, by States, in 1898 and in 1915, and under specified acts or grants of Congress to June 30, 1918.

Homes for soldiers, F. K. Lane (*Washington: U. S. Dept. Int., 1919, pp. 40*).—This publication relates to a bill to provide employment and rural homes for those who have served with the military and naval forces through the reclamation of lands, to be known as the "National Soldier Settlement Act." It indicates the number of responses of soldiers to the proposed plan of the Secretary of the Interior for land settlement, the legislation and resolutions adopted by the several States, resolutions of public bodies, and the laws similar to the proposed act adopted in other English-speaking countries.

Report to the Secretary of State for the Colonies of the committee appointed to consider the measures to be taken for settling within the

Empire ex-service men who may desire to emigrate after the War (*Empire Settlement Com. Rpt.* [*Gt. Brit.*], *1917, pp. III+62*).—Conclusions reached after the examination of witnesses and representatives of the over-sea dominions relate mainly to plans for settling ex-service men on the land in various parts of the British Empire, and to such phases of the problem as facilities provided and contemplated, need for capital and experience, group settlements, training, transport, finance, constitution of a central authority, etc.

Cooperation for small producers (*Bd. Agr. and Fisheries* [*London*], *Guides Smallhold., No. 3* (*1919*), *pp. 15*).—This, one of a series of guides to small holders, sketches the operations of a number of cooperative land renting, insurance, purchase, and producing societies, and the functions of the Agricultural Organization Society of Great Britain in assisting the formation of cooperative societies.

Report of the Peasants' League, 1914, 1915, 1916, 1917, E. Lytgaerens (*Boerenbond Belge Exercise, 1914, pp. 58; 1915, pp. 85; 1916, pp. 100; 1917, pp. 113*).—These volumes report the activities of the League in general and of several special sections, inspection services, insurance organizations, and mutual-aid societies.

The consolidation of agricultural cooperation in Russia, S. Maslov (*Russ. Coop.* [*London*], *3* (*1919*), *No. 10, pp. 149, 150*).—The functions of a Rural Council formed at Moscow in December, 1918, as a central advisory body for agricultural cooperative organization are briefly outlined.

The cooperative movement in South Africa, C. J. Pisar (*U. S. Dept. Com., Com. Rpts., No. 252* (*1919*), *pp. 519–526*).—Producers' associations among agricultural and pastoral industries, both those receiving Government assistance and under independent organization, also a few consumers' societies, are included in this account.

Farmers' Market Bulletin (*North Carolina Sta., Farmers' Market Bul., 6* (*1919*), *No. 29, pp. 14*).—In this number is continued the usual partial list of products which farmers have for sale, and a brief article by W. R. Camp, setting forth the benefits of a State Warehouse System provided by the North Carolina Legislature, is included.

Monthly Crop Reporter (*U. S. Dept. Agr., Mo. Crop Rptr., 5* (*1919*), *No. 10, pp. 97–108, fig. 1*).—In this are given the usual United States crop summary for October 1, 1919; estimated crop conditions October 1, 1919, with comparisons, a map illustrating the composite condition of all crops, and a general review of crop conditions on that date; estimated farm value of important products September 15 and October 1; average prices received by producers of the United States; and range of prices of agricultural products at important markets. Compilations of index figures of crop prices, 1910 to 1919, the base of which the average price December 1, 1866 to 1908, of wheat, corn, oats, barley, rye, buckwheat, potatoes, hay, flax, and cotton; of prices of meat animals to producers, monthly, for nine years, 1910 to 1918; of data showing monthly marketings of corn, wheat, oats, and flax by farmers, 1914–15 to 1918–19; the Florida and California crop report; potato production by months when harvested, 1917 to 1919; population and beef cattle, East and West compared; condition and forecast of cranberries and hops; and production of soy beans (for grain) in the United States, by States, 1918 and 1917, are shown. The International Institute crop report and special articles on trend of prices, time when crops are harvested, sectional meat consumption in the United States, cotton condition September 25, 1919, and changes in live-stock supplies in August are included.

[Agricultural statistics of the United Kingdom, 1902–1916] (*Statis. Abs. United Kingdom, 1902–1916, pp. 308–321*).—Information is continued which was previously noted (E. S. R., 37, p. 191).

Returns of produce of crops in Scotland (*Agr. Statis. Scot., 5 (1916), pt. 2, pp. 56–77; 6 (1917), pt. 2, pp. 56–77*).—These reports continue data previously noted (E. S. R., 37, p. 891).

[Returns of agricultural crops for 1917] (*Landw. Jahrb. Schweiz, 33 (1919), No. 2, pp. III+82–257*).—In this journal are given notes on the progress and status of Swiss agriculture for 1917, and information regarding returns of agricultural production, previously noted (E. S. R., 38, p. 91), is continued for the year 1917–18.

Agricultural statistics of Roumania (*Min. Indus. Com., Dir. Gen. Statis., Statis. Agr. României, 1918, pp. 35*).—This gives statistics of the number and area of agricultural holdings, area sown to the principal crops, and returns in 1918, previously noted for 1915 (E. S. R., 35, p. 894).

[Agricultural statistics of the Union of South Africa] (*Off. Year Book, Union So. Africa, No. 2 (1918), pp. 387–451, figs. 2*).—These statistics show land tenure, occupation, and live stock and agricultural production, mainly for the period 1910–1917.

[Land tenure and settlement: Agriculture and live stock in New Zealand, 1918], M. Fraser (*New Zeal. Off. Yearbook 1918, pp. 465–555, figs. 2*).—This continues information previously noted (E. S. R., 40, p. 195).

AGRICULTURAL EDUCATION.

[Progress in agricultural and veterinary education], J. Mackenna (*Rpt. Prog. Agr. India, 1917–18, pp. 151–161, 188, 189, 210–215, 217*).—This is a brief review of the principal educational activities in India in 1917–18, including notes and statistics on the postgraduate course at the Agricultural Research Institute and College at Pusa, the provincial agricultural colleges, the veterinary colleges at Bombay, Madras, Calcutta, and Lahore, the veterinary schools at Insein and Taunnggyi in Burma, and on vernacular schools including three agricultural middle schools with 2-year courses and one with a 1-year course in Bombay, and 2-year agricultural courses in connection with the agricultural colleges in the United Provinces and the Punjab. Two agricultural middle schools are also under construction in the Central Provinces.

Some observations on agricultural work in Egypt, America, and Japan. III, Japan, W. Roberts (*Agr. Jour. India, 14 (1919), No. 1, pp. 122–127, fig. 1*).—This article deals with agricultural education and the introduction of agricultural improvements in Japan.

The facilities for agricultural education, which is in charge of the Department of Education in Japan, include technical institutes, which are of the lowest grade and receive pupils who have finished the compulsory elementary education of 6 years; agricultural schools, of lower and higher grade (classes B and A), which, respectively, admit pupils who have completed the 6-year compulsory primary course, and pupils with an additional 2 years in the higher primary schools, and which offer 3- or 4-year courses; higher agricultural technical schools which receive graduates of the middle schools, offer a 3-year course, and turn out men qualified to teach in the middle and primary schools; and the agricultural college at the Imperial University of Tokyo.

Each prefecture has one agricultural school of class A, while many counties and towns have class B agricultural schools. The education is very general in all of them, with agriculture occupying from 2 to 6 hours a week, according to the class of school. The agricultural training is practical in all the middle and higher schools. The time-table is given of an agricultural school with a 3-year course which is typical of most of the middle and higher grade agricultural schools.

List of agricultural and horticultural officials, institutions, and organizations (*Dept. Landb., Nijv. en Handel* [*Netherlands*], *Verslag. en Meded. Dir. Landb., No. 2* (*1919*), *pp. 156*).—This is the annual official organization list of the Direction of Agriculture of the Department of Agriculture, Industry, and Commerce, including higher and secondary agricultural education and research institutions, agricultural and horticultural winter schools and courses, itinerant instructors, and associations in the Netherlands in 1919.

Report on agricultural and housekeeping schools for 1916–17 (*Aarsber. Offentl. Foranst. Landbr. Fremme, 1917, II, pp. XIV+371*).—This report gives detailed information concerning the faculty, students, equipment, instruction, farm work, and receipts and expenditures of the agricultural and housekeeping schools in Norway for 1916–17.

Tenth annual report of the School Garden Association of New York, 1918, edited by V. E. Kilpatrick (*Ann. Rpt. School Gard. Assoc. N. Y., 10* (*1918*), *pp. 24, figs. 17*).—This is a report of progress on the school, home, and farm gardens of New York City in 1918.

Regular classroom teachers were employed for the necessary supervision and teaching, resulting in economy of operation and in keeping the gardening directly in the school itself. As far as possible each child had his own garden and had what he grew. Wherever this plan was adhered to most closely there was had the greatest success in attendance and interest.

In the Bronx and Brooklyn school farms, of 10 acres each, 600 boys between the ages of 12 and 14 years had gardens of 1,250 sq. ft. each. The total value of the produce from the school gardens and farms was $17,664.27, of which $12,532.09 was from the gardens and $5,132.18 from the farms. The appropriation by the Department of Education for the school gardens was $7,500 and for the school farms $2,836.

A year in agriculture, with plans for home projects, A. W. Nolan (*Chicago: Row, Peterson & Co., 1919, pp. 394, figs. 42*).—This book is arranged in five parts, viz, agronomy, animal husbandry, farm business and life, horticulture including farm forestry, and home projects, outlining in detail projects for which study topics will be found throughout the text. The subject matter deals with the principal farm, forage, garden, and orchard crops, farm animals and live stock farming, etc. Notebook questions, suggested practical exercises, and home projects follow each chapter. Brief statements are given with reference to the organization, purpose, and activities of a number of country life organizations, such as the grange, farmers' institutes, farmers' union, etc., and of the progress that must be made by rural life institutions, i. e., the farm, the farm home, the country school, the country church, etc. An appendix contains the text of a recommended constitution and by-laws of a high school and country life club and a brief list of references.

A textbook in general science and the economics of daily life, H. Brownell (*Philadelphia: P. Blakiston's Son & Co., 1918, pp. XI+383, figs. 118*).—This text includes among others chapters on the chemistry of the home, dealing with rooms and their furnishings, fuel and lights, some foodstuffs, cost of living, etc.; the surroundings of the home, such as the garden and its care, soil conditions for plant growth, some plant studies, the usefulness of plants to man, trees, and birds; and the farm—poultry and eggs, the horse, cows and the dairy industry, lessons on corn, apple raising as an industry, wheat and wheat growing, and the origin and nature of soils.

A source book of biological nature-study, E. R. DOWNING (*Chicago: Univ. Chicago Press, 1919, pp. XXI+503, pl. 1, figs. 338*).—This book is one of a science series, as stated by the author, that is written to meet the chief need in science instruction to-day, viz, a more efficient organization of the course of study with a view to its socialization and practical application. The text is intended for the use of students in normal schools and schools of education and of teachers. The material is arranged in problem form and is selected for its social and practical values. Chapters are devoted to animals of pond and stream, insects and insect allies, birds, animal companions, wayside flowers, common trees, seeds and seedlings, the garden, and spore-bearers. A bibliography is appended to each chapter.

Nature teaching, F. WATTS (*London: Govt., 1918, 4. ed., enl., pp. VII+214, figs. 22*).—In this revision of this text, previously noted (E. S. R., 13, p. 494), in addition to minor changes the chapters on insects and fungi have been rewritten to bring the subject matter into accord with recent ideas and developments, and the information on plant habitats has been revised.

Teaching home economics, A. M. COOLEY, C. M. WINCHELL, W. H. SPOHR, and J. A. MARSHALL (*New York: The Macmillan Co., 1919, pp. XII+555*).—The object of this book, which is intended for use as a text primarily in normal schools and colleges and by teachers in service, is to offer suggestions for the organization, administration, and teaching of home economics studies. It comprises five parts dealing respectively with (1) home economics as an organized study in the school program, including chapters on the response of womanhood to modern social demands, the response of educational agencies to the needs of women, the development of home economics in response to the needs of the girl, and the interrelation of home economics with other subjects in the curriculum; (2) various schemes of organization of home economics studies in the elementary school, four-year, junior, and senior high schools, including evening classes and continuation courses, and in rural schools, and home economics in other organizations which contribute to the education of the girl; (3) the planning of lessons in home economics, including suggestions for characteristic lessons, a study of basic elements in planning the individual lesson, management problems, and standards for testing methods of instruction in home economics; (4) the home economics teacher and supervisor and their preparation, the utilization of community interests in the teaching of home economics, equipment, literature, and opportunities in the teaching of home economics; and (5) outlines of courses of study in operation in different high and trade schools and a complete list of furnishings for an apartment. Each chapter is followed by suggestions for study and review and references for collateral reading.

MISCELLANEOUS.

Report of the Guam Station, 1918 (*Guam Sta. Rpt. 1918, pp. 61, pls. 13*).—This contains reports of the animal husbandman in charge and the agronomist and horticulturist, and meteorological observations. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Report of the Porto Rico Insular Station, 1918 (*Ann. Rpt. Insular Expt. Sta., Dept. Agr. and Labor, Porto Rico, 1918, pp. 144*).—This contains the organization list, a report by the director for the fiscal year ended June 30, 1918, including an extensive résumé of the previous development and work of the institution, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

NOTES.

Alaska Stations.—For some time these stations, especially those at Rampart and Fairbanks, have devoted much effort to the securing of early ripening cereals. A large number of varieties from various parts of the world have been tested and selections made from the earliest maturing ones for further observation. Head to row plantings have been made for several years, and a number of strains have been secured that ripen several days earlier than the original varieties. In addition to selection work, a large amount of hybridization has been done at the Rampart station, and, after crosses are produced and the desirable strains established, they are sent to the Fairbanks station for extended trial on a field scale. This work has been in progress for about ten years with very satisfactory results.

In 1918 a distribution of seed grain was made to a number of farmers in the Tanana Valley in an effort to induce them to begin grain production on an independent basis. The results for the first year were so suggestive of possibilities that the experiment was repeated in 1919. A thrashing report was received recently which showed there were produced in 1919 by 22 farmers in the Tanana Valley 1,128 bu. of spring wheat, 2,811 bu. of oats, and 121½ bu. of barley. In addition, the station at Fairbanks produced in the same season 303 bu. of spring wheat, 774 bu. of oats, and 125 bu. of barley. The amount of wheat yet to be thrashed is estimated at about 600 bu., making the total production of grain more than 5,000 bu.

In 1918 the station at Fairbanks put in a small mill for grinding grain, and during the first season it produced considerable whole wheat or Graham flour. A sample of this flour was submitted to the Bureau of Chemistry of the U. S. Department of Agriculture and given a thorough chemical and baking test. The wheat is characterized by its hardness, and the quality of the bread produced from the flour was excellent. A report on the baking qualities of the flour states that in volume, texture, and elasticity the loaf was almost equal to that produced from standard flour, and that it was "one of the best whole wheat or Graham flours ever tested in the laboratory." During the past season a bolting device has been added to the mill, and white flour is now being produced.

Cornell University and Station.—A joint committee for the promotion of education in agriculture and home economics has been formed by committees of farmers and others in the State, and this committee has presented to the legislature a plan for the substantial completion of the State College of Agriculture. This plan will involve increases in salaries for the staff and a building program involving the expenditure of over $4,000,000.

A bill has been introduced in the legislature to establish at the university a separate college of home economics to be known as the New York State College of Home Economics. This change, if adopted, will involve little more than one of administration, since the new college would be an outgrowth of the present department of home economics and would use the same building and equipment.

Dr. Karl J. Seulke has resigned as assistant professor of animal husbandry to become eastern representative of the American Aberdeen-Angus Breeders Association, with headquarters at Ithaca. Dr. W. H. Rankin, assistant professor of plant pathology and plant pathologist, has been appointed in charge of the field laboratory of plant pathology at St. Catherines, Ont., in the Canadian Department of Agriculture, and has entered upon his duties.

North Carolina College.—Dr. B. W. Wells, assistant professor of biology of the University of Arkansas, has been appointed professor of botany and plant pathologist and in charge of the department of botany. I. V. Shunk has been appointed instructor in the same department.

North Dakota College and Station.—Substantial salary increases have been granted the members of the college station and extension staff, effective January 1.

J. L. Tompkin, assistant animal husbandman in the station, has resigned to become county agent for Grand Forks County beginning February 1. E. D. Stewart, superintendent of the Langdon substation, became demonstration farm superintendent February 15 vice W. R. Porter, who will assume charge of the station work in marketing, vice T. A. Hoverstad resigned. Turner H. Hopper has been appointed research agricultural chemist, beginning January 1. Miss Mayme Dworak has taken over a portion of the teaching work in botany, thereby releasing C. I. Nelson and E. S. Reynolds so that they may devote half time to station work in bacteriology and botany, respectively.

Oklahoma College and Station.—The resignations February 15 and February 10, respectively, are noted of D. R. Johnson, assistant professor of agronomy and assistant agronomist, to accept a position at the Iowa College, and W. Magee, assistant professor of animal husbandry, to accept a position in Texas.

Vermont University.—O. M. Cambrun, professor of dairy extension work, has been appointed in charge of the new division of animal husbandry of the reorganized Massachusetts State Department of Agriculture.

Wyoming Station.—Dr. Karl T. Steik, engineering research chemist for over seven years, has resigned to accept a commercial position. Miss M. Higgins, agricultural librarian, has resigned to take up community service work in Riverside, Cal.

Fig Experiment Station in California.—According to a note in the *Fig and Olive Journal*, the J. C. Forkner Fig Gardens has set aside a tract of 10 acres near the townsite of Fresno, Cal., for a fig experiment station, to be devoted primarily to experiments in fig culture. I. J. Condit, formerly assistant professor of citrus culture in the University of California, has been appointed director of the station.

Animal Husbandry at New York University.—A recent issue of *Breeders' Gazette* states that a department of animal husbandry and animal industry has been established in the veterinary college of the university. It is also expected to provide a university farm with facilities for experimentation and instruction. Dr. William Herbert Lowe has been appointed in charge of the department.

American Society of Agricultural Engineers.—This society held its thirteenth annual meeting at Chicago on December 29, 30, and 31, 1919.

The feature of the first day was the presentation of five papers describing projects for extension work in agricultural engineering, viz, in farm machinery, by F. W. Duffee; household equipment, by M. H. Hoffman; farm sanitation, by H. W. Riley; land reclamation, by E. R. Jones; and farm buildings, by D. Scoates. With the exception of the paper on the farm sanitation project, all of these papers were descriptive of work already being carried on by the extension divisions of State agricultural colleges. This is especially the case with the project in land reclamation, which is being conducted in Wisconsin, and the project in farm buildings being conducted in Texas. These projects tended to show the effectiveness with which extension teaching in agricultural engineering can be carried on.

In an instructive report made by L. C. Landis on Country Water Systems, a new type of small pneumatic pumping system was described, which is intended to supersede the so-called autopneumatic system of pumping, the utility and efficiency of which have been much discussed in the past. The pneumatic pump of the new type can be used in deep or shallow water and in cisterns, open wells, or bored wells. An important feature of its construction is the elimination of wearing parts such as tended to lower the efficiency of the autopneumatic system.

A number of special papers and reports were presented, including one by J. B. Davidson on Influence of Speed on the Draft of Plows, based on tests conducted at Iowa State College. It was found that an increase in the field speed from 2 to 3 miles per hour of a plow with a general purpose moldboard will result in an increase of the draft of from 8 to 12 per cent, varying with the soil. Doubling the speed will result in an increase of draft of from 16 to 25 per cent. The amount of work accomplished is increased 50 and 100 per cent, respectively. The furrows are laid more smoothly and the furrow slices better pulverized at the higher speeds. It is considered that there are no inherent difficulties in plowing stubble ground in good condition at a speed of 4 miles per hour, and that plows can be operated at even higher speeds if specially designed for that purpose.

Efficiency of horse labor was discussed at length by Wayne Dinsmore. It was pointed out that better use can be made of horses on farms by eliminating the underweight, inefficient horse, and that the efficiency of horse labor on farms can be in that way increased to an extent which will very materially reduce the substitution of mechanical power for horsepower.

Other papers presented were as follows: Educational Value of Tractor Demonstrations, by A. E. Hildebrand; Soil Erosion in Iowa, by M. H. Hoffman; What We Know and What We Guess at in Drainage Design, by D. P. Weeks; Thrashing Methods, by L. H. Van Volkenburg; and Engineering Features of Land Clearing, by John Swinehart. The last paper pointed out that in Wisconsin alone there are 10,000,000 acres of usable cut-over land averaging 60 stumps per acre. Further development of improved machinery and methods for the removal of these stumps is considered highly desirable. Investigations with explosives have shown the desirability of using those which produce a slow heaving action rather than a quick shattering action. Trinitro-toluol has been found to be a very effective explosive in land clearing when used in small charges, in spite of its terrific action, and while it can not be manufactured to compete with dynamite, there is use for all the war salvage T. N. T. available. The opinion was expressed that more publicity should be given to electric blasting as preferable to the cap and fuse method. Mud capping is considered to be applicable for splitting stumps, and depth of hole and proper tamping are important factors in getting efficient results. Trials of machines for stump pulling have developed weak points in both engine-operated and horse-operated apparatus. A suitable machine must be simple, light in weight, and of low price, and must develop both strength and reasonable speed on the pulling line. For old tough stumps a combination of stump puller and explosive is effective, but in any case the power machinery should include means for piling the stumps.

A number of special committees reported on the subjects of education, testing and rating, farm field machinery, research, barn ventilation, sanitation, drainage, farm structures, farm buildings, and data. The report of the data committee as presented by R. W. Trullinger consisted mainly of recommendations relating to the preparation of a handbook of agricultural engineering.

The difficulties of the problem were discussed, and several hundred references to agriculturing data, selected at random from recent numbers of *Experiment Station Record*, were presented to show somewhat the scope of the problem and also to serve as a basis for a general classification of subjects. Owing to the nature and scope of the *Record* it was recommended that its Rural Engineering Section serve as a basis for the selection of data for the handbook.

At the business session it was decided that, owing to the close relation existing between the society and manufacturers of farm implements and machinery, steps should be taken to increase the liability of all members belonging to commercial organizations in the maintenance of the society. This decision was based on the ground that those members employed by State and Federal institutions are generally paid such small salaries as to be unable to afford the expense of attending the annual meeting and of bearing the pro rata expenses of the work of the society.

Proposed Federal legislation to create a Bureau of Agricultural Engineering in the U. S. Department of Agriculture was also discussed, and it was agreed to cooperate with the National Implement and Vehicle Association and the Society of Automotive Engineers on the standardization of tractors and tractor parts.

Officers for the ensuing year were elected as follows: President, F. N. G. Kranich, Chicago, Ill.; vice presidents, F. W. Ives of the Ohio State University and W. B. Clarkson, Owatonna, Minn.; secretary-treasurer, J. B. Davidson of the Iowa State College; and members of the executive council, A. J. R. Curtis, Chicago, Ill.; Daniels Scoates of the Texas College; Raymond Olney, St. Joseph, Mich.; I. W. Dickerson, Charles City, Iowa; and F. A. Wirt of the Maryland College.

American Meteorological Society.—This society was organized and held its first sessions December 29–31, 1919, in connection with the St. Louis meeting of the American Association for the Advancement of Science, of which it was made an affiliated society. The stated objects of the society are the advancement and diffusion of the knowledge of meteorology and climatology and the broadening of their applications in public health, agriculture, engineering, aeronautics, industry, and commerce.

The membership includes professional and amateur meteorologists as well as engineers, ecologists, geographers, farmers and fruit growers, and others interested in meteorology and climatology and their various practical applications. Among the committees is one on agricultural meteorology, of which J. Warren Smith of the U. S. Weather Bureau is chairman, and whose purpose is to advance the knowledge of the relation of weather and climate to the various kinds of crops and farming operations.

The officers of the society for the current year are R. DeC. Ward of Harvard University, president; W. J. Humphreys of the U. S. Weather Bureau, vice president; Robert E. Horton, hydraulic engineer, Voorheesville, N. Y., treasurer; and Charles F. Brooks of the U. S. Weather Bureau, secretary. The society plans to publish a Bulletin of notes, news items, queries, etc., including a monthly statement of the activities of the various committees. It will not publish scientific papers, although it will attempt to comment upon such as may be of interest to the members of the society.

American Farm Bureau Federation.—Representatives of over 30 States met in Chicago, Ill., November 12 to 14, 1919, to organize the American Farm Bureau Federation. A constitution was adopted to become effective when ratified by 10 State organizations.

The object of the new body is set forth in the constitution as to "correlate and strengthen the State farm bureaus and similar State organizations of the several States in the national federation; to promote, protect, and represent the business, economic, social, and educational interests of the farmers of the Nation; and to develop agriculture." Membership is to consist of State farm bureau federations and State agricultural associations based on the farm bureau or similar plan. The governing body is to be a board of directors, composed of bona fide farmers and chosen by the State organizations, and this body in turn selects an executive committee and other officers. The Secretary of Agriculture and the Director of the States Relations Service are authorized to participate in the meetings of the executive committee, but without voting privileges.

A large number of resolutions were adopted setting forth the attitude of the federation toward the questions of the day. One of these resolutions declared that "the strength and origin of the American Federation of Farm Bureaus has been achieved through cooperation with the State and Federal Departments of Agriculture upon a sound educational program of local work," and expressed a purpose to "continue such cooperation, permitting neither business enterprises nor legislative activity to diminish such cooperative educational activities." Another resolution commended the extension work of the U. S. Department of Agriculture and the program of the Office of Farm Management, and advocated further development of the latter office and of the Bureau of Crop Estimates.

J. R. Howard, Clemons, Iowa, and S. L. Strivings, Castile, N. Y., were elected temporary president and vice president, respectively, pending the completion of a permanent organization on March 3, 1920.

National Research Council.—Announcement was recently made of the organization for 1919–20 of the council and its subdivisions. This body was established in 1916 at the request of President Wilson by the National Academy of Sciences, with the cooperation of the national scientific and technical societies of the United States. Originally conceived primarily with reference to the war emergency, steps were taken in 1918 to perpetuate it following an executive order by the President, with its chief purpose to survey and collate and to initiate, promote, and stimulate research in science and its useful applications.

The present organization consists of thirteen divisions, six of which are designated as divisions of general relations, including a government division, a research information service, and divisions of foreign relations, states relations, educational relations, and research extension. The seven remaining divisions are known as divisions of science and technology, including the physical sciences, engineering, chemistry and chemical technology, geology and geography, medical sciences, biology and agriculture, and anthropology and psychology.

The division of biology and agriculture is under the chairmanship of Dr. C. E. McClung, professor of zoology and director of the zoological laboratory of the University of Pennsylvania, with Dr. L. R. Jones, professor of plant industry of the Wisconsin University and Station, as vice chairman, and I. W. Bailey, professor of forestry at the Bussey Institute, F. R. Lillie, professor of zoology at the University of Chicago, G. R. Lyman, pathologist in charge of the Plant Disease Survey of the U. S. Department of Agriculture, H. F. Moore, deputy commissioner of the U. S. Bureau of Fisheries, and President A. F. Woods of the Maryland State College as members of the executive committee. The membership of the division comprises representatives of the American Society of Agronomists, the American Society of Bacteriologists, the Botanical Society of America, the Ecological Society of America, the Society of American Foresters, the American Genetics Association, the American Society for Horticultural Science, the American Phytopathological Society, and the Society of American Zoologists, together with eleven members at large.

There are also fifteen committees of the division, among which may be mentioned those on bibliography and publications, organization and inquiry on climatology, cooperation and coordination, educational relations, fellowships, fertilizers, food and nutrition (with subcommittees on animal nutrition, human nutrition, and protein metabolism in animal feeding), forestry, plant pathology, a committee to secure lists of current biological problems, physiological salt requirements of representative cultivated plants, and biological investigations in Tropical America.

Genetical Society of Great Britain.—What is known as The Genetical Society has been recently organized in England, with Hon. A. J. Balfour as president and Miss C. Pellew of the John Innes Horticultural Institution and Professor R. C. Punnett of Cambridge University as secretaries. Membership has been restricted to those now or formerly engaged in genetical research, the teaching of genetics, or the practical breeding of plants and animals. A further limitation of 120 members is also made, as it is expected to hold meetings mainly at places where breeding work is in progress.

Reorganization of the Board of Agriculture and Fisheries in Great Britain.—*Nature* states that there has recently been a reorganization of this board into five main departments, of which three will deal with agriculture. These three departments remain under the immediate supervision of the president of the board, but with the following heads: Sir Daniel Hall, chief scientific adviser to the board and director-general of the intelligence department; Lawrence Weaver, chief commercial adviser to the board and director-general of the land and supplies department; and F. L. C. Floud, general secretary to the board and director-general of the finance and economics department.

Woburn Experimental Farm.—An unusually complete account of this institution is given by its director, J. Augustus Voelcker, in a recent number of the *Agricultural Gazette.* This farm was established by the Duke of Bedford in 1876 on his own estate, primarily for the purpose of testing on light soil deficient in lime some of the conclusions reached at Rothamsted in experiments on heavy soil well supplied with lime, particularly with reference to continuous culture of wheat and barley, the use of manures and fertilizers, and the value of the unexhausted manurial residue in soils. The farm now consists of 132 acres in one tract and 27 in another, and is maintained by the Royal Agricultural Society and the Development Commission of the Board of Agriculture. It is equipped with the ordinary farm buildings, special feeding stalls and scales, a laboratory, and a pot-culture station.

The results of the continuous culture experiments with wheat and barley, which have been in progress for 43 years, in general confirm those of similar experiments at Rothamsted. There has been a striking demonstration of the failure of wheat and barley under continuous application of sulphate of ammonia, as well as of the efficacy of liming as a corrective of this condition. In general "the theoretical differences between cake and corn feeding, as set out in manurial valuation tables, have not been confirmed."

The experiments in green manuring have not shown the expected superiority of a leguminous crop over a nonleguminous crop as a preparation for grain, "for in every case, on this light land, mustard has proved a better preparation than tares." Experiments with alfalfa have shown the benefit of potash fertilizers and "the superiority of Russian, Canadian, and Province varieties." Methods of seeding, manuring, and managing grasslands and pastures have received much attention. Many varieties of wheat, barley, oats, and other crops have been tested, as well as rates of seeding, size of seed, time of application of fertilizer, and the like. Attention has also been given to the manuring of potatoes and the prevention of potato disease, as well as the growing of sugar beets, rye, maize, soy beans, gorse, and other new crops.

The subject of silage and the feeding of cattle and sheep have been very fully investigated. Particular attention has been given recently to calf rearing, with special reference to elimination of tuberculosis from herds and the use of milk substitutes.

The pot-culture station, which is unusually well equipped, has been used especially for investigations on the influence of the rarer soil constituents, such as lithium, zinc, copper, lead, arsenic, boron, and strontium on plant growth. It has also furnished the means of supplementing and explaining many field results and establishing new facts concerning magnesium in the soil, the action of lime, chalk, and the like. It has also made it possible to work on soils other than that of Woburn and to study their proper fertilizer treatment.

New Laboratory at Rothamsted.—The new laboratory building at the Rothamsted Experimental Station was formally opened October 20, 1919. This is a substantial two-story and basement structure, erected at a cost of about $130,000, of which $50,000 was contributed in public subscriptions from farmers, $50,000 allotted from the Development Fund, and the remainder obtained in other ways. Announcement is made that plans are also under consideration for a special building for the use of the new department of plant pathology, including entomology, which will be temporarily housed in the new building.

Agricultural Research in the British Colonies.—The consent of the Lords Commissioners of the Treasury has been obtained to an estimate of $100,000 a year for five years to be expended in stimulating scientific research, with a view to developing the economic resources of the British Colonies and Protectorates. If this grant is obtained it is expected to administer it through a small committee to be known as the Colonial Research Committee, which will work in cooperation with the Department of Scientific and Industrial Research, the Imperial Resources Bureau, the universities, and other existing institutions.

A committee has been appointed by Lord Milner, Secretary of State for the Colonies, to consider whether the staff of the agricultural departments in the colonial services is adequate, and to recommend increases in staffs, consider salary scales, and make recommendations in general for recruiting the staffs and otherwise improving the service.

Research in the East African Protectorate.—Provision has recently been made by the Government of the East African Protectorate for a scheme of research directed toward the exploration and development of the resources of that country. This involves a series of what are designated as equatorial experiment stations, to be located at every interval of 1,000 ft. in altitude from sea level to 9,000 ft. Meteorological data will be taken, and studies will be made on acclimatization and the suitability of different regions for various crops. Laboratory work will be carried out in the Government laboratories near Nairobi.

Forest Products Laboratory in Australia.—According to a Note in *Science*, steps are being taken by the Commonwealth Advisory Council of Science and Industry of Australia to establish a forest products laboratory at Perth, West Australia, for the purpose of experimenting in the utilization of the by-products of the timber mills and of the forests. With a view to securing information available at similar laboratories I. H. Boas, lecturer in chemistry at the Perth Technical School, has been sent to the United States and Canada to conduct inquiries.

Spanish Chamber of Agriculture.—A royal decree of September 2, 1919, established in each Province and in Ceuta and Melilla in Morocco an official chamber of agriculture. Membership is by election, each taxpayer of twenty-five pesetas (about $4.82) on agricultural property being required to be an elector. The chambers must be heard on all proposed agricultural reforms or other legislation affecting agriculture, may promote agriculture and stock-raising, buy farm machinery, seeds, and breeding stock, may organize to manufacture and export agricultural products, promote agricultural education, undertake campaigns against diseases of crops or stocks, form arbitration councils, prosecute adulteration of farm products, organize savings banks and employment agencies, establish agricultural credit systems, homes for the aged, pensions, etc. They are required to give special attention to the collection of statistics of production and consumption.

Necrology.—John Aitken, widely known for his meteorological researches, especially on the formation of mist, fog, clouds, and dew, died at Ardenlea, Falkirk, Scotland, November 14, 1919, aged 80 years. His great original contribution to meteorology was the establishment of the fact that invisible dust particles are the nuclei upon which water vapor condenses to form mist, fog, and cloud, but he also made important contributions to the subjects of color in cloud, sky, and sea, and the dynamic laws of cyclones and anticyclones. His scientific papers were published mainly in the *Philosophical Magazine* and through the Royal Society of Edinburgh.

It has been recently learned that Dr. H. F. Heinrich, assistant in the Central Experiment Station, Munich, and Dr. Fleischmann, director of the dairy institute at Weihenstephan, were killed on the battle field during the war. The deaths are also noted of Dr. J. Kaiser of the Experiment Station at Speyer; Professor Dr. Foerster, director of the Control Station at Berlin; Professor Dr. Loos, chief of division in the Experiment Station at Augustenberg; Dr. B. Schulze, shortly after his retirement from active service as director of the Experiment Station at Breslau; and Professor Dr. Heinrich, formerly director of the Experiment Station at Rostock.

Dr. P. Baccarini, Italian plant pathologist and professor of botany and director of the botanical garden at Firenze, died July 24, 1919.

Miscellaneous.—Dr. R. H. A. Plummer, reader in physiological chemistry, University College, London, has been appointed head of the biochemical department of the Crailstone Animal Nutrition Research Institute, which is under the direction of Aberdeen University and the North of Scotland College of Agriculture.

The Fream Memorial prize was awarded in 1919 to a woman, the recipient taking first prize in the examination for the National Diploma in Agriculture in Great Britain.

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EXPERIMENT STATION RECORD.

VOL. 42. FEBRUARY, 1920. No. 2.

There is a widespread impression that, comparatively speaking, scientific research in agriculture is not receiving the recognition and support it deserves, and that in consequence it is not rendering the highest practical service of which it is capable. At the Chicago convention of the Association of American Agricultural Colleges and Experiment Stations, Secretary Houston stated that up to a few years ago investigation had seemed to run ahead of facilities for conveying information, but now "the danger is rather that our teaching may outrun the accumulated stock of knowledge and become sterile," and the Secretary made a strong argument for a well-balanced program of both instruction and research throughout the Nation. The need of increased appropriations for research work was voiced at the convention by resolutions adopted by the Section on Experiment Station Work and by the Section on Extension Work.

The experiences of the war developed an exalted conception of the value of science, particularly the chemical and physical sciences, as an aid in practical affairs, but there is no evidence that there yet exists on the part of the public any clear and correct conception of the processes by which science accomplishes its results or of appreciation of the limitations and needs of the investigator himself. It is not as clearly and generally understood as it ought to be that the great influence that science has had in improving agriculture and the vital aid it was able to bring to agricultural production and conservation in time of National stress, were in the main the product of long years of quiet, patient endeavor of many men in many fields—a product built up little by little through a slow, continuous process.

The failure of popular appreciation and understanding of scientific research may be explained not only by the slow processes of such work but also by the characteristics and limitations of the scientist himself. For, in the words of another—

"The scientist is cautious, accurate, and impersonal. He uses his imagination, not to jump at conclusions, but as a guide to experiment and investigation. He hesitates to announce a discovery until he has fully verified it, and then he limits himself strictly to the one step he has taken into the Unknown, and avoids flights of fancy into its speculative possibilities. If his knowledge is fragmentary, he refuses to fill out its gaps, and he is resolutely non-committal on what he does not know. * * * The public, on the other hand, demands cocksureness, especially on all the consequences which a discovery suggests to the imagination. It is intensely personal, and inquires first what use it can make of the discovery, or whether it confirms or opposes its prejudices. It undervalues accuracy, overvalues vivid picturesqueness, and does not understand impersonality or impartiality at all. It jumps at conclusions, and refuses to take 'I don't know' for an answer."

It must be recognized that the scientist is laying the foundations and preparing the materials for enduring progress, and though he may present a difficult problem from the standpoint of making his work known to the public and useful in practice, we can not afford to let him suffer discouragement or allow his work to lag for lack of intelligent appreciation, support, and exploitation.

The most effective agency through which the results of scientific investigation are made to influence farm life and practice is the cooperative extension work in agriculture and home economics, and this in turn is the agency which is most directly dependent upon such work for continued efficiency and most vitally concerned in keeping the public correctly informed as to its importance and needs. Extension work is popular work. It lends itself to popular exploitation more readily and wins popular appreciation and support more easily than research. Its growth in popular esteem has been very rapid in recent years, with the result that investigation is less prominently in the public mind than it was a few years ago, and is temporarily dropping behind in support. At the same time, the investigational forces have been greatly depleted and all too few young men seem attracted to the research field with its requirements of special preparation.

There appears to be, therefore, urgent need for more thoughtful, concerted, and continuous effort to utilize fully every available means of bringing the needs of research to public attention. Much can be done in this direction by improving the method of presentation of subject matter and by the use of more and better illustrative material in publications giving the results of experiment and investigation.

The dissemination of agricultural information by means of the printed page, and more especially by means of the formal bulletin and report, has evident weaknesses, but perhaps it is not always fully realized to what a great extent the mature results of the work of the Department of Agriculture and the experiment stations disseminated by this means have actually been embodied in the permanent literature of agriculture, incorporated in common thought, and applied consciously or unconsciously in agricultural practice.

Within thirty years the permanent American agricultural literature has grown from almost nothing to a respectable library, including many excellent books. In large part these books have been written by station or Department men, or embody in permanent form results of station and Department work first given out largely in more fugitive bulletin form. The permanent and far-reaching influence of these books in school and home can not be measured. Furthermore, the bulletins have been a great mine from which that influential agency of popular education, the agricultural press, has drawn a large share of its most valuable material, and the popular lecturer derived his most convincing arguments. In these indirect ways, fully as well as by direct instruction in the hand of the farmer, have the publications of these institutions molded popular thought on agricultural subjects and influenced agricultural practice.

While, therefore, this means of dissemination has rendered and is still rendering great service as an educational agency, it can undoubtedly be still further improved by making the bulletins and reports more attractive in style, matter, and illustration. Much progress has been made in recent years along this line, but more can undoubtedly be accomplished. Especially can the illustrations be improved in the way of increasing their human interest and showing the practical significance of different features of research.

Visual instruction is assuming a larger and more influential place than ever before in all lines of educational work. "Seeing is believing" is as true of station work as it is of extension and school work. It is especially true of research from the standpoint of its understanding and appreciation by the general public. Most investigators fully realize the importance of a good pictorial record of the technical results of their work, but comparatively few appear to fully realize the value of pictures which interpret to the layman the significance of the processes and results of research, or the importance of the human interest element in such pictures. Illustrative material of this kind is not likely to be obtained casually in the ordinary course of investigation. It can be secured only as a result of a carefully thought out plan covering the whole progress of the investigation, and keeping in mind not only scientific accuracy and skill in technique, but also the practical lessons to be taught, and the people, other than investigators, to be reached and interested by the pictures.

It is believed that the greater use of pictures, of the kind indicated, in the illustration of station publications would aid much toward removing popular misconception as to scientific investigation. Several of the State extension services, some of them in cooperation with the States Relations Service, are developing their illustrative material along this line with a considerable degree of success. It is believed that the possibility of doing something of the same kind with reference to experiment station work is a matter which may well receive more attention.

The channels of popular publicity are more numerous and freer than the means of permanent record of research through formal reports and bulletins. They are not always used as fully and as effectively as they might be to enhance the understanding of scientific investigation or appreciation of the investigator. Much can be done to improve this medum of disseminating useful knowledge resulting from research and to make it more truly educational as regards the possibilities, the resources, and the limitations of science. There is no more effective or acceptable method of doing this than by the discriminating use of good illustrative material.

One effect of the war is seen in the necessity of a change in the conduct of the well known Woburn Experimental Fruit Farm, a privately supported station established over twenty-five years ago. This farm is located on the estate of the Duke of Bedford, and has been maintained through all these years by his benevolence. It is now announced that economic conditions resulting from the war have rendered it impossible to continue the farm on its original basis.

Fortunately, however, the enterprise is not to be closed or the experiments terminated. Thanks to the action of the Board of Agriculture and the Development Commission, and to the exertions of the Lawes Agricultural Trust, the farm is to be continued for the present on practically the same lines and under the same management as heretofore, but with funds provided by the Government.

The Woburn Farm had an interesting origin. Mr. Spencer Pickering, a physical chemist and lecturer on chemistry at Bedford College, met with an accident in his laboratory in the late eighties which necessitated his seeking health in outdoor work. He engaged temporarily as a laborer at Rothamsted, later becoming a small farmer and landowner and turning his attention to horticulture and fruit growing. Here he became impressed with the unsatisfactory basis of the art, and the desirability of having an experiment station where practical questions could be worked out "free from any taint of commercial expediency."

Lacking the necessary land and funds for such an undertaking, Mr. Pickering laid his plans before the Duke of Bedford, a former college friend whose predecessors had for generations identified themselves with progress in agriculture and horticulture. The plan met with approval, and the farm was accordingly established in June, 1894.

About twenty acres of land were set apart for the experiments, located adjacent to that used by the Royal Agricultural Society for its experiment station (Woburn Experimental Farm). This location is in a county adjoining that in which the Rothamsted Station is situated, both stations being only a short distance from London.

It appears that the site of the station has been criticized somewhat, especially as not being on typical fruit land, and unforeseen difficulties from an experimental point of view have developed, notably the danger of spring frosts. It was, however, originally selected by one of the highest practical authorities in the subject at that time, and it represents a difficulty which is not uncommon in the stations of this country.

The station has been conducted jointly by the Duke of Bedford and Mr. Pickering, the latter serving as director and having charge of the experimental features. It has not been equipped for investigation in the various branches of science related to fruit growing except in the case of chemistry, in which Mr. Pickering was himself a specialist. It has concerned itself primarily with cultural and similar problems which did not call for special scientific investigation. It is modestly described as "the work of one man only, not very well equipped for his task, handicapped by residence at a distance, and in recent years by ill health."

Readers of the *Record* are familiar with the reports of this station, which have appeared from time to time and been reviewed in these pages. They will be interested to know that with the change of status and the completion of twenty-five years of work, the results obtained at the farm to date have been brought together and issued in book form in a volume entitled Science and Fruit Growing. It was prepared under the joint authorship of the Duke of Bedford and Spencer Pickering, and contains about 350 pages with numerous illustrations.

The volume is not closely restricted to the results at Woburn but contains frequent reference to similar investigation elsewhere, including that at the American stations, and to some degree is a summary of existing information relating to science and fruit growing as bearing particularly on conditions in England. Some of the chapters are quite general in character, such as might be looked for in a manual under this title, dealing with plant growth, injurious insects and diseases, fungicides, insecticides, etc., while others relate quite specifically to the problems and experiments at Woburn, summarizing the reports of the station on various points.

The latter is true, for example, of such chapters as those on planting, trenching, pruning, manuring, consecutive fruiting of trees, flowering of apple trees, soil studies, heated and treated soil, and similar questions. The effect of sod on trees and the possible cause of this effect forms a topic for quite extended discussion, leading up to the toxic effect of one crop upon another and toxic products in the soil.

Altogether, the volume supplies an interesting résumé of a quarter of a century's work at this quite unique institution devoted to problems of fruit growing. It is gratifying to know that the usefulness of the station has appealed so strongly that it is to be continued under Governmental support; and it is also a satisfaction to know that its direction will not suffer change but will continue to be supplied by Mr. Pickering, to whose inspiration it owes its origin.

The presidential address before the Section of Agriculture at the last meeting of the British Association dealt with a very practical matter, namely, the improvement and maintenance of pastures. This is a subject which has as yet received but little attention from the experiment stations in this country, but in Great Britain its importance has led to quite extensive and long continued series of experiments. The review of these and of the methods of determining the return from pasture treatment constituted the basis of the above address by Prof. William Somerville, of Oxford, as reported in *Nature*.

Although approximately two million acres of grass land and pasture were plowed up in Great Britain during the war, the present area of permanent and temporary grass land in the United Kingdom is about twice that under crops. This is exclusive of some sixteen million acres of mountain land used for grazing. Of the 14,500,000 acres of permanent grass land in England and Wales 70 per cent is under pasture and 30 per cent under hay. Hence attention to the improvement of pasture is relatively urgent.

As Professor Somerville points out, it is often difficult to determine the factor or factors that go to the making of high class pastures. A large amount of attention has been given to the botanical composition of the herbage on the more famous pastures of Britain, but the results are not readily correlated with feeding value; i. e., pastures which are practically equal in feeding value may vary widely in respect to their botanical composition. As Hall and Russell conclude, "the feeding value of a pasture is largely independent of the floral type." Factors considered of greater weight are the depth and physical character of the soil, soil moisture and temperature, density of the herbage, and the natural or induced fertility of the soil, especially in respect to phosphoric acid.

The classic experiments at Rothamsted on the manuring of grass land for hay, begun in 1856 and continued ever since, have thrown much light on the practice of manuring, the effects of various elements on the yield and chemical composition of the product, and on the flora of the fields. But to arrive at the feeding value of the product, Professor Somerville urges the importance of feeding experiments with animals and cautions that erroneous conclusions may be reached if attention is confined to the weight of the product or even its botanical and chemical composition.

In experiments in pasture management, he considers equally open to objection the plan frequently followed of determining the results of different treatment in terms of hay, with chemical and botanical analysis. As he points out, the competition between the various classes of plants may be very different in a hay field from that in a well grazed pasture, and while in the case of hay the product is removed, on pasture land there is a continuous return of manure to the soil. For these reasons he stresses the importance of measuring the effect of pasture treatment by the results obtained in grazing stock. Such trials he designates as experiments in "manuring for meat."

Reference is made to reports of nine such pasturage experiments in England, twelve in Scotland, two in Ireland, and one in New Zealand, some of which have been going as long as sixteen and even twenty-three years. "The outstanding feature of these experiments is the great and profitable effect of phosphates. In this material the farmer is placed in possession of an agent of production the effects of which on the output of meat, milk, and work from the pastures of this country are only limited by the supplies. In many cases the increase of meat it trebled, and even quadrupled, with a return on the original outlay that runs into hundreds of per cent."

As between the various sources of phosphate, the evidence is that basic slag is the most effective, especially when net financial returns are considered. The primary effect of phosphates is attributed to the marked stimulus they give to the growth of clovers and other Leguminosæ, on which the improvement of poor pastures is dependent. Professor Somerville remarks on the long period over which the action of phosphates persists, the effects of slag being apparent at the end of nine years, which he explains by the constant circulation of manurial elements from the plant to the animal and back to the soil again, and through the accumulation of nitrogen in the form of humus.

Although in the Rothamsted meadow experiments potash had great influence on the yield and composition of hay, in these pasture experiments the gain with potash has "only in very rare instances" been a profitable one, and several long time experiments are referred to in which after a few years the potash was "positively and progressively injurious."

Lime added to phosphate has proved beneficial, the effects being treble in one series for twenty-one years in a soil containing nearly six-tenths per cent of calcium carbonate. Nitrogen, either as ammonium sulphate or nitrate of soda, was found disadvantageous; while it stimulated the vigor of the grasses, this reacted on the growth of the clovers with the result that the production of meat was sometimes substantially reduced.

This reduces pasture improvement, as indicated by the long time experiments in Great Britain, very largely to the simple matter of supplying phosphates, with the occasional addition of lime and potash. Professor Somerville expresses the belief that few forms of expenditure are more certain in their results than the judicious use of such fertilizer on grass land, and that the capacity of the country to produce meat and milk can be largely and rapidly increased, with great pecuniary gain to the farmer and still greater economic advantage to the Nation.

These experiments, although in a field but slightly touched in this country, have no small interest because of the prominence of the pasturage system in Great Britain, and the extent and duration of some of the trials. Such an analysis of experience in this type of inquiry and such a summary of results will be helpful in guiding similar work here. The findings will be suggestive and may have application on some of the worn pasture lands of this country.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

An introduction to the physics and chemistry of colloids, E. HATSCHEK (*London: J. & A. Churchill, 1919, 3. ed., pp. 116, figs. 17*).—In the present edition a number of minor corrections and additions have been made to the material of the previous edition (E. S. R., 35, p. 501).

Phthalic anhydrid.—I, Introduction, H. D. GIBBS (*Jour. Indus. and Engin. Chem., 11 (1919), No. 11, pp. 1031, 1032*).—In this introduction to a series of papers on phthalic anhydrid investigations at the Bureau of Chemistry, U. S. Department of Agriculture, the author outlines briefly the work leading up to the development of the naphthalene oxidation method for the preparation of phthalic anhydrid, and explains the cooperative agreements entered upon with chemical manufacturers for the purpose of introducing the process into their plants on a commercial scale.

A new gasometric burette, P. NICOLARDOT and G. PREVOT (*Ann. Falsif., 12 (1919), No. 127–128, pp. 140–145, figs. 3*).—The burette described consists of a glass cylinder about 30 cm. in length and 2 cm. in diameter joined to a cylinder or bulb about 6 cm. in diameter and of a volume two, three, or four times that of the first. The burette is fitted with glass stopcocks at either end. The reagents employed, and the method of operation when large or small volumes of gas are to be measured, are described in detail.

A further study of the De Roode method for determining potash, T. E. KEITT and H. E. SHIVER (*Jour. Indus. and Engin. Chem., 11 (1919), No. 11, pp. 1049–1052*).—A study is reported of the accuracy of the modification of the De Roode method for determining potash previously noted (E. S. R., 39, p. 12), in the presence of nitrate of soda, ammonium salts, high content of phosphates, and large amounts of organic matter. While no error in the method was indicated in the presence of as much as 1.8 per cent of ammonia, the presence of 5 per cent of ammonia was found to cause high results. It was found possible to obtain accurate results by substituting for the successive evaporations with nitric and hydrochloric acids two evaporations with aqua regia. This slight change in procedure was adopted.

Evidence is furnished that the method thus modified gives results in the presence of sodium nitrate slightly higher than the calculated results, but accurate within the limits of experimental error, while the Lindo-Gladding method gives low results due to occlusion of potash in the combined ammonia and ammonium oxalate precipitates. The results obtained with the modified De Roode method in the presence of large amounts of organic matter and of phosphatic material were also found to be well within the limits of experimental error.

The authors conclude as in the former report that the method is more accurate than the Lindo-Gladding method, the latter method varying in accuracy with the kind and amounts of impurities present in the material.

Determination of calcium oxid in lime and limestones; and the use of calcium oxalate as a standard for potassium permanganate, E. LITTLE and W. H. BEISLER (*Jour. Amer. Leather Chem. Assoc., 14 (1919), No. 11, pp. 613–621*).—Methods for the determination of available and total calcium oxid in lime are described which are said to be more accurate than the alkalinity method owing to the fact that soluble alkalis present as impurities do not affect the determination. The details of the method for determining available calcium oxid are as follows:

A mixture of 1 gm. of the sample and 950 cc. of hot water is shaken thoroughly in a stoppered liter flask, and after several hours is made up to the mark with distilled water at 20° C., shaken thoroughly, and allowed to settle. One hundred cc. of the clear solution is pipetted into a beaker, acidified with hydrochloric acid, treated with 5 cc. of bromin water, and boiled to oxidize any ferrous iron to ferric. The solution is made slightly alkaline with ammonium hydroxid, heated to boiling, and the calcium precipitated by adding slowly with constant stirring a slight excess of hot ammonium oxalate solution. After heating on a water bath for 20 minutes with occasional stirring, the precipitate is filtered, washed with hot water until free from chlorids, acidified with sulphuric acid, and then washed through a hole made in the filter paper into a beaker and diluted to 150 cc. The funnel is washed down with about 30 cc. of 1:3 sulphuric acid and then with hot water, the washings being collected in the beaker containing the calcium oxalate. The solution is finally heated to about 80° C. and titrated with standard potassium permanganate.

The total calcium is determined as follows: To a 0.3 gm. sample in a 200 cc. beaker are added 10 cc. of water, 15 cc. of concentrated hydrochloric acid, and from 3 to 5 cc. of concentrated nitric acid. The mixture is heated to boiling, digested on a water bath for 20 minutes, and then boiled for a few minutes after adding 100 cc. of water. A slight excess of ammonium hydroxid is added and the calcium precipitated as the oxalate by adding an excess of hot ammonium oxalate solution, after which the same procedure is followed as in the above determination.

As a standardizing agent for potassium permanganate the authors recommend the use of calcium oxalate prepared by dissolving C. P. calcium oxid in hydrochloric acid, neutralizing with ammonia, making slightly acid with acetic acid, and precipitating by the slow addition of ammonium oxalate at boiling temperature. The thoroughly washed precipitate is dried to constant weight at 140° C.

Analysis and composition of calcium phosphate, L. Grünhut (*Pharm. Zentralhalle, 60 (1919), No. 10, pp. 111–113*).—The author describes a method for determining the composition of mixed calcium phosphates in terms of normal, primary, and secondary phosphates, which involves the following determinations: (1) The alkalinity of the water-soluble portion, by titrating a water solution of the sample with N/10 hydrochloric acid, using methyl orange as indicator; (2) the water-soluble phosphate, by adding calcium chlorid to the above solution and titrating with N/10 sodium hydroxid, with phenolphthalein as indicator; (3) the total alkalinity, by dissolving another sample in hydrochloric acid, titrating with N/10 sodium hydroxid with methyl orange as indicator to a yellow end-point and then with N/10 hydrochloric acid to a reddish brown color; and (4) the total phosphate, by heating the neutralized filtrate from (3) with calcium chlorid and titrating with N/10 sodium hydroxid with phenolphthalein as indicator.

The method and necessary calculations are described in detail.

A method for bringing elementary sulphur into solution for analysis, A. P. Bjerregaard (*Jour. Indus. and Engin. Chem., 11 (1919), No. 11, p. 1055*).—The method, which was devised at the New Mexico Experiment Station to analyze some samples of sulphur intended for use in making sheep dips, consists in dissolving the sulphur in dry liquid bromin, after which it is oxidized by nitric acid and the sulphuric acid thus formed precipitated by barium chlorid.

Determination of small quantities of alkaline iodids in the presence of bromids and nitrites, E. Lasausse (*Jour. Pharm. et Chim., 7. ser., 20 (1919), No. 6, pp. 177–181*).—The method, which was devised to determine the iodin of marine algae after calcination in the presence of an alkali, consists essentially of the following steps: (1) The oxidation of nitrites and cyanids by potassium permanganate at a temperature of 40° C. in a medium made acid with phosphoric acid; (2) reduction by means of sodium bisulphite of chlorates and bromates formed in the preceding operation; (3) treatment at boiling temperature with potassium permanganate, which oxidises the iodids to iodates, but does not affect chlorids and bromids; and (4) liberation of the iodin by the action of an excess of potassium iodid and phosphoric acid and its determination by titration with hyposulphite.

The reagents and method of procedure are described in detail.

The proximate analysis of commercial casein, F. L. Browne (*Jour. Indus. and Engin. Chem., 11 (1919), No. 11, pp. 1019–1024*).—The methods described by Höpfner and Burmeister (E. S. R., 29, p. 411) for the proximate analysis of casein, as modified at the U. S. Forest Products Laboratory, Madison, Wis., are described, and the results are reported of a large number of analyses by the modified methods of commercial and pure samples of casein and of samples prepared in a commercial creamery by commercial methods, but under the supervision of an expert in dairy practice from the Bureau of Animal Industry, U. S. Department of Agriculture. The types of casein prepared under this supervision included buttermilk, grain curd, natural sour (ejector), sulphuric acid, sulphuric acid cooked curd, hydrochloric acid cooked curd, and hydrochloric acid caseins. From a comparison of the analytical results obtained in the analysis of some 200 samples of caseins of different types and methods of manufacture the influence of various factors on the composition of the casein is summarized as follows:

"The fat content of caseins depends upon the efficiency of the cream separation (for skim milk casein) and is independent of the method of manufacture. The ash content varies slightly with the thoroughness of the washing of the curd, but chiefly with the method of precipitation, the important factors being the amount of acid used and the length of time and intimacy of contact between curd and acid. The kind of acid seems to be immaterial, provided that different acids are used in equivalent amounts.

"The nitrogen content depends chiefly on the thoroughness of the washing of the curd. It indicates the presence of 3 to 12 per cent of organic impurities (lactose, etc.). The acidity in general increases as the ash content decreases, but is also largely influenced by the amount of acid impurities present, which in turn varies with the thoroughness with which the curd is washed."

The author concludes that the present commercial methods of making technical casein can be improved to a considerable extent, particularly by giving the curd a more thorough washing after precipitation. The ejector method for natural-sour and the grain-curd method for acid casein are thought to give the best results.

The determination of the saponification number, W. Fahrion (*Chem. Umschau Geb. Fette, Oele, Wachse, u. Harze, 24 (1917), No. 5, pp. 57–59*).—To secure greater uniformity in saponification number determinations at the hands of various workers, the author recommends that at least 3 gm. of oil be used, that the alkali contain not more than 10 per cent of water, that the mixture be heated 10 minutes, and that the solution for titration contain not more than 50 per cent of water.

Determination of the acid number of crude fat from oil seeds, intermediate products, and oil cake, A. Beneschovsky (*Ztschr. Landw. Ver-*

suchsw. Österr., 19 (1916), No. 3–4, pp. 103–152; abs. in Chem. Abs., 11 (1917), No. 22, p. 3121).—This paper consists of a report of the maximum and minimum acid numbers obtained for various vegetable oils and for the crude oil from oil cakes, and a discussion of the significance of these numbers in judging the age and rancidity of the product.

A modification of the phenylhydrazin method of determining pentosans, P. MENAUL and C. T. DOWELL (*Jour. Indus. and Engin. Chem., 11 (1919), No. 11, pp. 1024, 1025*).—The modification described consists of precipitating with phenylhydrazin the furfurol obtained by distillation of the pentosans with sulphuric acid and determining the excess of phenylhydrazin in the filtrate by oxidation with an ammoniacal solution of copper sulphate.

Concordant results obtained with this method and the phloroglucinol method in the determination of pentosans in three samples of grain sorghum cut at different stages of growth are reported. The former method is recommended in preference to the latter, as requiring less time and employing a much cheaper reagent.

The analysis of lemon juice, M. R. HUERRE (*Jour. Pharm. et Chim., 7. ser., 20 (1919), No. 1, pp. 5–9*).—The analysis of the juice of 3 groups of 5 lemons each is reported and summarized as follows: The juice contained in 100 cc. from 7 to 7.5 gm. of citric acid, from 0.4 to 0.6 gm. of malic acid, from 0.4 to 0.5 gm. of sucrose, from 1.8 to 2 gm. of invert sugar, 0.4 gm. of pectic and mucilaginous material, and from 1.6 to 1.8 gm. of ash.

Contribution to the study of the adulteration of pepper, A. LENDNER (*Schweiz. Apoth. Ztg., 57 (1919), No. 41, pp. 591–593*).—The author states that an adulteration of powdered pepper, frequently practiced in recent years, has been the addition of a powder obtained by drying and grinding small unripe oranges. The anatomical structure of these immature oranges is described, and a method for the detection of the powder in pepper is outlined which consists in treating the sample for a short time with a 4 per cent solution of sodium hydroxid, which dissolves the glucosid hesperidin from the orange powder. After washing with water a drop of Congo red solution is added and the sample examined under the microscope. The adulterant, if present, can be identified by the red coloration of its cellular structure.

Biological methods for detecting adulteration in yerba maté, A. C. MARCHISOTTI (*Rev. Sud-Amer. Endocrinol., Immunol., y Quimioterapia, 2 (1919), No. 10, pp. 387–393*).—Various methods which have been suggested for detecting adulteration in yerba maté are noted, and an investigation of the possibility of using for such purposes precipitin and anaphylaxis tests with guinea pigs is reported with negative results.

Milk (*Jaarb. Dept. Landb., Nijv. en Handel Nederland. Indië, 1916, pp. 127–130*).—Some of the results of analyses of 650 samples of milk collected in different parts of Java are reported as follows: The fat content of 97 per cent of the samples was over 2.7 per cent, being between 3 and 4.5 per cent in the majority of cases. The fat-free residue averaged over 8 per cent and the refractive index over 34.5.

Formulas are given and explained for the determination of total solids from the specific gravity and fat content of the milk, and for the determination of sucrose, lactose, and invert sugar in condensed milk. The presence of sucrose in milk as determined by uranium acetate and diphenylamin is considered by the author to be the best evidence of adulteration of the milk with coconut milk.

The oxidation of lactose and lactic acid and its influence upon the analytical results obtained with milk preserved by potassium dichromate.

MARCHADIER and GOUJON (*Ann. Chim. Analyt., 2. ser., 1 (1919), No. 9, pp. 288–290*).—Evidence is furnished that the blue color developing in milk preserved with potassium dichromate is due to the formation of a double oxalate of chromium and potassium resulting from the successive oxidation of lactose and lactic acid. This is considered to explain the fact that such samples on analysis give a weight in total solids larger than the sum of the individual constituents determined.

Home preparation of pork, A. M. PATERSON (*Kansas Sta. Circ. 76 (1919), pp. 13, figs. 8*).—This circular gives general directions for the home butchering, curing, and smoking of pork, with recipes for the preparation of various pork products.

A complete course in canning, A. I. JUDGE (*Baltimore: Canning Trade, 1919, 4. ed., rev., pp. 254, figs. 13*).—This is the fourth revised edition, edited by A. I. Judge, of a volume which was originally republished from serial articles appearing in *The Canning Trade*, dealing with the preparation of canned foods on a commercial scale. The subject-matter includes a discussion of the best market for various products, descriptions of factory requirements and machinery, and directions for the commercial canning of vegetables, fruits, meats, milk, and soups, the manufacture of preserves, jellies, jams, pie fillers, salad dressings, and flavoring extracts, and the preservation of fish and shell food.

A manual of canning and preserving, T. M. CARRELL (*New York: E. P. Dutton & Co., (1919), pp. VII+101*).—This manual contains directions and recipes for canning fruits and vegetables, and for preparing jellies, jams, preserves, fruit juices, fresh fruits, pickles and relishes, and citrus fruit marmalades.

Canning of spinach.—Consideration of standards, C. H. CAMPBELL (*Canner, 49 (1919), No. 19, pp. 45, 46*).—The author compares the different commercial methods employed in canning spinach, and states in conclusion that before any commercial standards can be established a careful study should be made of the effect on the product of varying factors during the growth of the spinach and during the canning process.

Tomato preserves, P. CARLES (*Mém. Soc. Sci. Phys. et Nat. Bordeaux, 6. ser., 5 (1914), No. 2, pp. 355–375*).—This article consists of a discussion of the hygienic value of tomatoes, a description of various methods employed in France for preserving tomatoes, analyses of commercial tomato products from various sources, and a discussion of possible methods of adulteration of such products.

The functions of lye in olive processing, W. V. CRUESS (*Fig and Olive Jour., 4 (1919), No. 2, pp. 4–6*).—The general results are reported of an investigation of the action of lye during the successive stages of olive processing.

It was found that the small amount of lye (0.3 to 0.5 per cent) generally added to standing solutions, and which is considered by many to hold harmful bacteria in check and to improve the pickling qualities of the olives, actually favors the growth of bacteria, and that the salt and not the lye is the controlling factor in preventing bacterial action. In the first lye treatment, which apparently causes the darkening of the ripe olives through the action of the lye as an oxygen carrier for the color, it was found that the lye if too concentrated dissolves the color out of the olives, particularly if the exposure treatment is employed instead of the treatment with running or aerated water.

The removal of bitterness from the olives by the last lye treatment is thought to be due to the destruction of a glucosid by lye and not simple neutralization. The actual concentration of lye necessary in excess of neutralizing the acidity of the olives is apparently about 0.25 per cent of free lye. This has been found to require about 8 lbs. of lye per ton of olives. It is considered advisable to use the lye a second time after calculating its strength by titration with N/10 hydrochloric acid.

The influence of concentration of sugar solutions upon the growth of microorganisms, O. Grove (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1918, pp. 34–38; also in Jour. Bath and West and South. Counties Soc., 13 (1918–19), pp. 127–131*).—Experiments to determine the percentage of sugar necessary in jams and similar preparations to prevent development of yeasts, bacteria, and molds at room temperature are reported with the following results:

In a sugar solution of 50 per cent concentration yeasts and bacteria did not develop. In a 45 per cent solution development took place if the acidity was below 0.8 per cent, but stopped completely at an acidity of 1.2 per cent. An addition of 1.5 per cent of salt also completely stopped the development of yeasts and bacteria. A sugar concentration of 65 per cent was necessary to check the growth of *Penicillium glaucum*, and there was feeble growth after one month at 70 per cent concentration. The development was not completely stopped before the acidity was over 1 per cent or the percentage of salt about 2 per cent.

The preserving value of various spices and essential oils, O. Grove (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1918, pp. 29–33; also in Jour. Bath and West and South. Counties Soc., 5. ser., 13 (1918–19), pp. 122–127*).—The preserving action of several spices and essential oils for tomato pulp and for malt extract was tested by inoculating the product to which the preserving substance had been added with a few drops of a mixture of microorganisms and keeping the open bottles in an incubator at a temperature of 25° C. The spices were used in the form of alcohol, water, and acetic acid extracts.

The growth of the added microorganisms in tomato pulp was completely stopped by an addition of 3, 4, and 5 per cent of an alcoholic extract of cloves, and the development was checked by 4 and 5 per cent of an alcoholic extract of celery seeds, by 3, 4, and 5 per cent of an alcoholic extract of horse-radish, by 1 and 2 per cent of an alcoholic extract of cloves, by 3, 4, and 5 per cent of an alcoholic extract of cinnamon, and by 4 per cent of scraped horse-radish. In all the other cases the additions did not seem to have any unfavorable effect upon the development of the microorganisms. In testing the essential oils malt extract was used instead of tomato pulp. Nearly all of the oils were found to have a greater or less preserving action, those of mustard, cloves, aniseed, and cinnamon having a higher preserving value than any of the other kinds tried.

The author is of the opinion that a mixture of spices or essential oils might be prepared which would act as an effective preserving agent and a flavoring agent at the same time.

Drying vegetables and fruits for home use, F. P. Lund (*U. S. Dept. Agr., Dept. Circ. 3 (1919), pp. 23, figs. 5*).—This circular contains directions, with accompanying diagrams, for the manufacture of two varieties of driers suitable for home use over a wood or coal range, gas stove, or oil stove. Suggestions are made for the proper selection and preparation of vegetables for drying, and the relative merits are discussed of the two methods of drying, starting at a high temperature, which is gradually lowered, or starting at a low temperature, which is gradually increased. Special directions, including methods of preparation, time of blanching, and temperature of drying, are given for the particular treatment to be used with a large number of vegetables and fruits.

Fruit drying, J. Tribolet (*Agr. Jour. So. Africa, 10 (1919), No. 57, pp. 39, 41, 43, 45, 47, 49–52, figs. 2*).—Directions are given for the sun-drying of fruits under conditions prevalent in the Union of South Africa.

The chemistry and industry of table mustard, P. Carles (*Proc. Verb. Soc. Sci. Phys. et Nat. Bordeaux, 1917–18, pp. 14–20*).—Variations in the chemical constitution of different species of mustard seed and in the amount of mustard oil obtained under different methods of treatment in the manufacture of table mustard are described, and the importance of placing the mustard industry under chemical direction is emphasized.

The color changes of sugar cane juice and the nature of cane tannin, F. W. Zerban (*Jour. Indus. and Engin. Chem., 11 (1919), No. 11, pp. 1034–1036*).—This paper reports a study of the water-soluble phenol previously noted as being one of the factors causing the color changes of sugar-cane juice (E. S. R., 40, p. 12). The method of isolating the substance from the sugar cane and the tests used for its identification are described in detail, and the results obtained are summarized as follows:

"The polyphenol of the sugar cane giving a green color with ferric salts is not pyrocatechin. It is a true tannin, giving a precipitate with gelatin, and is, like the oak tannins, derived from pyrocatechin, not from pyrogallol. Heat alone produces pyrocatechin, and no pyrogallol; dilute acids give rise to phlobaphene and protocatechuic acid, but not ellagic or gallic acids; potash fusion yields protocatechuic and acetic acids, but no gallic acid or phloroglucin."

Methods and machinery for the extraction of oil from seeds, etc., B. J. Eaton (*Agr. Bul. Fed. Malay States, 7 (1919), No. 1, pp. 1–12*).—This article deals with methods of extraction of fixed vegetable oils or fats. The extraction process by the aid of volatile solvents is described briefly and the expression process in greater detail, including the plate, cage, and expeller systems.

Note on the oil of Ceratotheca sesamoides, E. R. Bolton (*Analyst, 44 (1919), No. 520, pp. 233, 234*).—The analytical constants of the oil of *C. sesamoides*, a seed closely allied to *Sesamum indicum*, are reported as saponification number 190.2, unsaponifiable matter 1.58 per cent, iodin number 110.6, refractive index at 40° C. (Zeiss) 59.6, free fatty acids as oleic 0.63 per cent, and specific gravity at 15° C. 0.9163. While these results are in general within the limits for sesame oil the Baudouin reaction was negative. The oil is considered suitable for use as an edible oil or in the making of margarin.

Horse chestnut oil, A. Heiduschka and A. Zeileis (*Ztschr. Untersuch. Nahr. u. Genussmtl., 33 (1917), No. 10, p. 446*).—To obtain the oil, horse-chestnuts were ground and extracted with alcohol to remove the greater part of the saponins. The meal thus obtained was extracted with ether yielding 3.23 per cent of a dark yellow oil, the analytical constants of which were as follows: Saponification number 175.5, Reichert-Meissl number 1.01, Polenske number 0.42, index of refraction at 25° C. 68.1, at 40° 60.7, and at 45° 57.6, iodin number 99, acid number 11.67, and Hehner number 92.79.

Chemical study of the oil from Indo-Chinese "Mac-Ken" nuts, F. Heim (*Bul. Écon. Indochine, n. ser., 22 (1919), No. 136, pp. 457–462*).—The oil of "Mac-Ken" nuts, a species of chestnut, when purified is of the consistency of butter, and separates at 22° C. into a solid portion composed almost entirely of stearin and a liquid of a deep color, not unpleasant odor, and fluidity comparable to olive oil. The analytical constants of this oil are as follows: Saponification number 201.95, iodin number 67.51, Reichert-Meissl number 6.12, Hehner number 92.86, acetyl number 35.1, and acid number 51.86.

The lumbang oil industry in the Philippine Islands, R. H. Aguilar (*Philippine Jour. Sci., 14 (1919), No. 3, pp. 275–285*).—This paper describes the two kinds of lumbang nuts known in the Philippine Islands from which oils are obtained—lumbang bato (*Aleurites moluccana*) and lumbang banucalag (*A. trisperma*), and discusses various factors which must be taken into consideration in the treatment of these nuts for oil production on a profitable commercial scale.

Vegetable fibers used in paper making, F. C. Clark (*Tech. Assoc. [Pulp and Paper Indus.] Papers, Ser. II, 1919, pp. 8–10*).—The classification and characteristics of the more common vegetable fibers in the textile and paper industries are presented in a table, which includes the name of the fiber, dimensions of individual fibers, their microscopical appearance, and the color reactions with chloriodid of zinc, phloroglucinol, and anilin sulphate. Directions are given for preparing the stains employed.

Paper pulp: Possibilities of its manufacture in Australia, G. Lightfoot (*Advisory Council Sci. and Indus., Aust., Bul. 11 (1919), pp. 5–39*).—This bulletin consists of a collection of information from various sources concerning the possibilities of the manufacture of paper pulp in Australia from wood and from fiber plants.

Tearing resistance of paper, S. D. Wells (*Tech. Assoc. [Pulp and Paper Indus.] Papers, Ser. II, 1919, pp. 39–41, figs. 2*).—A modification of the Schopper tensile strength tester used by the author at the Forest Products laboratory, U. S. Department of Agriculture, for determining the tearing resistance of paper is described and illustrated, and the results obtained with it in the examination of different kinds of paper are reported. The test, if conducted under standardized conditions, is thought to be reliable and to give valuable additional information regarding the physical properties of a paper, particularly where strength and wearing properties are essential.

Nitrating of woodpulp cellulose, S. D. Wells and V. P. Edwardes (*Tech. Assoc. [Pulp and Paper Indus.] Papers, Ser. II, 1919, pp. 59–62, fig. 1*).—Previously noted from another source (E. S. R., 41, p. 14).

METEOROLOGY.

Weather and crops in New Jersey, J. W. Smith (*N. J. Dept. Agr. Circ. 29 (1919), pp. 11–16, fig. 1*).—The general climatic conditions of New Jersey, the influences which modify them, and their relation to the growth of crops are briefly discussed.

"The length of time between killing frosts or the length of the possible growing season averages 200 days in the extreme southern portion of the State, 170 days or less in the central portion, and is less than 160 days in the highlands of the northwestern part. The available growing season in four-fifths of the years varies from less than 120 days in the extreme northwest to over 160 days in the extreme south. The average date of the last killing frost in the spring is during the first 10 days in May in the northwestern and the interior of the southern portion, and during the second decade (period of 10 days) in April along the coast and Delaware Bay. The first killing frost in the fall occurs on the average during the latter part of September in a few northwestern districts, but not until the last decade in October or even later in the section modified by the water of the ocean or Delaware Bay.

"The principal crop-growing months are favored with a large percentage of the annual rainfall, and the fall is usually well distributed and ample for crop needs. . . . The total precipitation for the three spring months averages 11.1 in., for the summer 13.1, fall 10.7, and for winter 11.3 in. The average annual snowfall varies from slightly less than 20 in. on the southern coast to over 45 in. in northwest highlands. The average number of days each year with an appreciable amount of precipitation varies from 100 to 125. The prevailing winds are from the west or northwest."

The climatic requirements of crops, especially corn and potatoes, based largely upon previous studies by the author in Ohio and elsewhere, are also briefly discussed. A chart is given which shows that from 1885 to 1917, inclusive, there were "11 years when July was appreciably warmer than the average for the month, and other records show that the yield of potatoes in New Jersey for those years has averaged 12 bu. per acre less than normal. On the other hand, during the 18 years that July has been appreciably cooler than the average in this State, the yield has averaged over 18 bu. per acre above the normal."

The correlation between yield of crops and variations in temperature and precipitation in Sweden, A. Wallén (*K. Svenska Vetensk. Akad. Handl., 57 (1917), No. 8, pp. 87, pls. 21, figs. 3*).—The theory of correlation is explained and the calculation and validity of coefficients of correlation are discussed. Correlations of temperature and precipitation, with yields of wheat, rye, barley, and oats, based on observations in Sweden from 1881 to 1910, inclusive, are given and discussed with reference to geographical distribution of the influence of variations in temperature and precipitation on crops, variation of the influence of temperature and precipitation on crops during the period of growth, mean variation of the influence of weather on crops in different parts of Sweden, calculation of partial coefficients of correlation and equations of regression, calculation of yields with the aid of equations of regression, and agreement between crop forecasts and weather forecasts.

The general conclusion indicated is that more intimate knowledge and study of factors involved in the relation of climate and crops are necessary before very definite correlations or forecasts are possible.

Precipitation, evaporation, soil moisture, and snow cover in forests and in the open, J. Schubert (*Met. Ztschr. [Brunswick], 34 (1917), No. 4–5, pp. 145–153, figs. 2*).—Various observations are summarized which indicate that precipitation is distinctly less in forests than in the open. Evaporation is more rapid and the soil is drier in the forest.

On the relation between wind and distribution of pressure, H. Jeffreys (*Proc. Roy. Soc. [London], Ser. A, 96 (1919), No. A 676, pp. 233–249, figs. 4*).—From a classification of about 600 wind observations over the North Sea, according to their velocities and directions, which showed that the most striking feature of the resulting values was their asymmetrical frequency distribution, "it is concluded that the principal cause of variation in the relation of the surface wind to the gradient is variation in the vertical distribution of turbulence; and it is shown that such variation could give the effects actually observed."

The snowfall of the United States, R. DeC. Ward (*Sci. Mo., 9 (1919), No. 5, pp. 397–415, fig. 1*).—This article discusses briefly the economics of snow; measurement of snowfall; the mean annual snowfall map of the United States; general controls of snowfall, snowstorms, and 24-hour snowfalls; and distribution of snowfall in the United States, dealing in some detail with the snowfall of the Pacific slope, western plateau region, Great Plains, and eastern United States. Short sections are also devoted to sleet and ice storms and to refutation of the widespread popular belief that snowfall is decreasing.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 6 (1919), Nos. 7, pp. 204, pls. 4, figs. 2; 8, pp. 203, pls. 4, figs. 2*).—These volumes contain brief summaries and detailed tabular statements of climatological data for each State for July and August, 1919, respectively.

Monthly weather report for the year, J. McCaig (*Ann. Rpt. Dept. Agr. Alberta, 1918, pp. 126–136, figs. 2*).—The weather conditions of each month of 1918 in the Province of Alberta, Canada, are briefly described and detailed data for temperature and precipitation of each month of the year at the various weather-observing stations in the Province are tabulated.

Distribution of rainfall over Germany, G. Hellmann (*[Sitzber.] Preuss. Akad. Wiss. Berlin, No. 22 (1919), pp. 417–432; abs. in Sci. Abs., Sect. A—Phys., 22 (1919), No. 259, p. 312*).—"The construction of a new rainfall chart of Germany based upon simultaneous observations extending over 20 years at about 3,700 places reveals the wettest and driest districts, as well as those regions over which winter rain is pronounced. The limits of mean annual rainfall shown on the map are 2,600 and 380 mm. [102 and 15 in.]. While as a rule summer is the season which gives most rain in Germany, the winter fall is greater than the summer fall in the higher districts of the West German hill-country; but in the Alps winter rains are unimportant."

International catalogue of scientific literature: F, Meteorology (*Internat. Cat. Sci. Lit., 14 (1919), pp. VIII+181*).—"The literature indexed is mainly that of 1914, but includes those portions of the literature of 1901–1913 in regard to which the index slips were received by the Central Bureau too late for inclusion in the previous volumes." The sections on the relation of climate to agriculture and forestry and on phenology contain a number of references more or less directly bearing upon agricultural production.

SOILS—FERTILIZERS.

Soils and soil formation in the light of colloid chemistry, G. Wiegner (*Boden und Bodenbildung in Kolloidchemischer Betrachtung. Dresden: Theodor Steinkopff, 1918, pp. 98, figs. 10*).—This is a treatise on soils and soil formation, with special reference to rôle therein of colloid chemistry or so-called dispersoid chemistry. In this connection the soil is considered to be a disperse colloid system.

Salt soils and alkaline soils: Experimental contribution to the origin of soda in soils, A. de Dominicis (*Staz. Sper. Agr. Ital., 51 (1918), No. 3–6, pp. 103–161; abs. in Chem. Zentbl., 1918, II, No. 23–24, pp. 982, 983; Internatl. Inst. Agr. [Rome], Internatl. Rev. Sci. and Pract. Agr., 10 (1919), No. 2, pp. 144–147*).—Experiments on the origin of soda in irrigated tropical soils are reported.

It is concluded that in the improvement of tropical soils by irrigation, the relation between irrigation and the movement, distribution, and transformation of neutral sodium salts must be taken into consideration. Conservation of water in the soil is often accompanied by a rising of salty subsoil waters, concentration of salts in the surface soil, and the rise of soda in place of neutral salts. The last is considered the worst occurrence, since it is the opinion that alkaline soils are less fit for plant life than salty soils. The soda may be removed by leaching, which, however, also removes colloidal mineral and organic matter.

It is further concluded that the origin of soda in soil can be attributed to double decomposition of sodium chlorid or sodium sulphate with calcium carbonate only in small degree, but that alkaline soils are indirectly dependent on the salty soils. The experiments show that soil alkalinity originates primarily from sodium absorbed through hydrolysis when in coagulated condition. The resulting sodium hydroxid can then react with calcium carbonate resulting in sodium carbonate. It is also concluded that the action of gypsum in improving alkaline soils is not a simple neutralization of the sodium carbonate, but rather a coagulation of the colloids and transformation into absorption compounds of calcium. This action is favored by the calcium sulphate of the gypsum, which is made more active by the presence of neutral sodium salts. In this connection it is the opinion that neutral salts themselves can indirectly bring about the same effect. Therefore, irrigation with salty waters is considered dangerous to the soil because they will act on compounds containing absorption compounds of sodium. It is considered necessary to accompany such irrigation by gypsum treatment.

The filtration of water in agricultural soils, O. Hughes (*Gior. Risic., 9 (1919), No. 5, pp. 74–78*).—An apparatus is briefly described for determining the relative velocity of lateral and vertical percolation of water in soils. The principle of the apparatus is apparently to compare the time required for pure water and a 1 per cent solution of sodium carbonate to percolate from the top to the bottom of a tube of the soil with the time required for a standard soil.

Tests of a clay soil with 42.83 per cent void space showed a time requirement of 113 hours and 42 minutes, while an alluvial soil with 57.86 per cent voids required 96 hours and 18 minutes. A sandy soil with 35.59 per cent voids required 158 hours and 20 minutes, and a sandy soil with 37.1 per cent voids required 80 hours and 48 minutes. It is considered evident that the physical and chemical properties of the different soils have a marked influence on the speed of percolation. Other data from experiments with red soils are discussed.

The effect of several types of irrigation water on the pH value and freezing point depressions of various types of soils, D. R. Hoagland and A. W. Christie (*Univ. Cal. Pubs. Agr. Sci., 4 (1919), No. 6, pp. 141–158*).—Experiments conducted at the University of California are reported, in which a number of different waters of interest from the standpoint of irrigation were applied to soils of several types and the effects on the freezing point depressions and on the OH-ion concentrations determined.

It was found that waters with a high percentage of primary alkalinity applied even in moderate quantities produced greatly increased OH-ion concentrations. The effect was far greater in sandy soils than in heavy soils. Waters with a high concentration of alkali salts soon produced excessive concentrations in the soil solution as shown by the freezing point depressions. This was especially true of sandy soils. "The determination of the OH-ion concentration and freezing point depression of soils frequently may be more convenient in practice and more useful as a basis of interpretation than the ordinary procedures used in analyzing alkali soils. Any appreciable increases in OH-ion concentration of the soil (especially when exceeding pH 8.5) appear to be injurious to seedlings. It is suggested that the geological method of classifying waters and the use of reaction values provide methods of expression which are very useful in interpreting the results of analyses of waters intended for irrigation purposes."

The Atterberg Schlamm cylinder, J. P. van Zyl (*Internatl. Mitt. Bodenk., 8 (1918), No. 1–2, pp. 1–32*).—This is a defense of the Atterberg apparatus for the mechanical analysis of soils, made on the basis of a number of analyses by the author.

Soil survey of Wapello County, Iowa, E. C. Hall and E. I. Angell (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 43, figs. 2, map 1*).—This survey, made in cooperation with the Iowa Experiment Station, deals with the soils of an area of 278,920 acres in southeastern Iowa. The uplands of the area range from level to gently rolling, and there are considerable areas of flat river flood plains or bottom lands.

The soils are of loessial, glacial drift, and alluvial origin. Including riverwash, 21 soil types of 15 series are mapped of which the Clinton silt loam, the Grundy silt loam, and the Lindley loam cover 31, 30.1, and 15.6 per cent of the area, respectively. Only a few areas of the soils lack good surface drainage.

Soil survey of Texas County, Mo., W. I. Watkins, E. D. Fowler, H. I. Cohn, J. A. Machlis, and H. H. Krusekopf (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 37, figs. 2, map 1*).—This survey, made in cooperation with the Missouri Experiment Station, deals with the soils of an area of 741,760 acres in south-central Missouri, near the center of the Missouri Ozark region. Its surface is predominatly rolling to hilly with some fairly level areas in the uplands. The regional drainage is well established.

"The soil material of Texas County has been derived from the country rocks, consisting of a series of cherty limestones underlying by far the greater part of the county and of sandstones underlying a portion of the extreme northern part and small strips along Big Piney Creek. . . . The soil material, as derived from the limestone rock, consists of a mass of clay, usually red in color, mixed with varying amounts of chert fragments, usually less than 3 in. in diameter, ranging from practically none to as much as 80 per cent of the mass. Where derived from sandstone the soil material consists of reddish sandy clay, ordinarily free from chert."

Including rough stony land, 23 soil types of 12 series are mapped, of which the Clarksville gravelly loam and stony loam, covering 33.4 and 18.7 per cent of the area, are the most extensive individual types.

Soil survey of Beaufort County, N. C., W. B. Cobb, E. S. Vanatta, L. L. Brinkley, S. F. Davidson, and F. N. McDowell (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 40, figs. 2, map 1*).—This survey, prepared in cooperation with the North Carolina Department of Agriculture, deals with the soils of an area of 587,600 acres in eastern North Carolina, which is located on the lower lying marine terraces of the Atlantic Coastal Plain, and is generally level with undulating or gently rolling areas near many of the streams, especially in the western end of the county. The drainage varies with the topography and is generally poor, artificial drainage being provided on nearly every farm.

The soils of the area are derived from unconsolidated sands and clays of sedimentary origin. Including muck, swamp, and tidal marsh, 18 soil types of 7 series are mapped.

Soil survey of Marlboro County, S. C., C. Van Duyne, W. E. McLendon, W. J. Latimer, and T. M. Morrison (*U. S. Dept. Agr. Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 33, figs. 3, map 1*).—This survey deals with the soils of an area of 332,160 acres in northeastern South Carolina. Marlboro County includes parts of five topographic belts. They are (1) the Marlboro Plain, (2) the Sandhill region, including (a) the Pegues Plateau, (3) the lower Coastal Plain, or Flatwoods, (4) the River Terraces, and (5) the Flood Plains of the rivers. The surface of the county varies from level to undulating and hilly. Drainage is well established in the undulating and hilly sections, but poorly established in much of the level country.

The soils are of residual, old sedimentary, and alluvial origin. "The soils of the Marlboro and lower Coastal Plains cover more than 80 per cent of the county, and include an even higher percentage of the cultivated area." Including muck, 48 soil types of 21 series are mapped, of which the Marlboro sandy loam, covering 16 per cent, and the Norfolk sandy loam, covering 10.3 per cent, are the most widely spread individual types.

Composition of the soils of Archer, Franklin, and Harrison Counties, G. S. FRAPS (*Texas Sta. Bul. 244* (*1919*), *pp. 3–78*).—This bulletin continues the series previously noted (E. S. R., 38, p. 324), and deals with the chemical composition of samples of soils from three counties in Texas, surveys of which have been previously noted (E. S. R., 25, p. 818; 34, p. 322).

A discussion of the analyses of the soils of Archer County indicates that the amount of active phosphoric acid present appears to be sufficient for all crops which can be grown, with the exception of the Vernon fine sandy loam. These soils are well supplied with potash, but it is thought that they are likely to need nitrogen sooner than any other plant nutrient. They are also well supplied with lime and none are acid.

"Many of the soils of Franklin County are low in phosphoric acid, and especially low in nitrogen. They are better supplied with potash." Some of the soils of the county are also acid, including some of the fine sandy loams, silt loams, fine sands, and clays. The use of lime is considered advisable only on the Wilson loam, Lufkin silt loam, and Sanders clays.

The soils of Harrison County were found to be particularly low in nitrogen and phosphoric acid, and many of them are acid. "They are also low in potash, but potash is not needed to so great an extent as the other fertilizer constituents for the maintenance of fertility in this section. The use of a proper rotation, including a legume to collect nitrogen, is absolutely necessary. In connection with this, applications of phosphate and of lime are advised."

The needs of Texas soils for lime, G. S. FRAPS (*Texas Sta. Bul. 243* (*1919*), *pp. 3–18*).—This bulletin discusses the need of Texas soils for lime.

It is stated that the acid soils of Texas are located chiefly in the eastern part of the State and in the Gulf Coast section east of Metagorda County. A table is given showing the relative abundance of acid soils in the various counties. There are few acid soils in the central and western parts of the State, and many other soils are rich in lime. It is also stated that the acidity of Texas soils which are acid is generally low, and that lime or limestone should not generally be used on these soils except where they are known to need lime for special purposes. Liming of the sticky clay soils in the Gulf Coast section and in eastern Texas has been found to facilitate cultivation, and is considered necessary where alfalfa is to be raised. Liming of acid loams, clays, and clay loams of these sections is also considered necessary.

"The use of lime on light sandy soils easily penetrated by water is not generally advised, on account of the loss of fertility which may take place from nitrogen being washed out. The best results with lime should be secured in a rotation of crops, including a legume to be turned under or grazed off for the purpose of securing nitrogen from the air."

Soil analyses (*Exposé Situation Gén. Algérie, 1917, pp. 498–501*).—Analyses of oasis soils from the Sahara desert are briefly discussed, indicating that these soils consist mostly of coarse sand, very little fine sand and organic matter, and occasionally an average amount of clay. The chemical analyses show a marked deficiency in phosphoric acid and nitrogen but a fairly good supply of soluble potash.

Provincial soil survey, R. S. FINLOW (*Ann. Rpts. Expert Off. Dept. Agr. Bengal, 1917–18, pp. 26, 27*).—Soil surveys of Bengal indicate that the silts in eastern and western Bengal are generally similar in composition, a high potash content being the most constant characteristic. "There is generally also a sufficiency of phosphoric acid which, in some isolated cases, is present in large quantities. There is a fair proportion of lime salts in eastern Bengal (averaging about 1 per cent), but there is generally no free carbonate of calcium. In western Bengal there appear to be greater divergencies in the matter of lime, some soils containing free calcium carbonate and up to 4 per cent of total lime; others, with no free lime, contain as little as 0.5 per cent total lime. Nevertheless, while it is very rare to find the percentage of lime in eastern Bengal as high as that of magnesia, this seems to be fairly often the case in western Bengal. . . .

"The red soils show comparatively wider differences than the silts. Those in eastern Bengal are, on the whole . . . , poorer in potash than the red soils of western Bengal. The other figures are not widely dissimilar, but there is a general tendency toward a higher lime content in western Bengal."

Analyses of the ash of typical crops have shown that Rhizoctonia in jute is a potash starvation phenomenon. "Rhizoctonia is very common on the red soils of eastern Bengal but rare in the silt soils. The ash of jute grown on the red soils may contain as little as 15 per cent of potash, whereas 40 per cent of potash is often found in the ash of plant grown on silt soil. Further, potash manuring has been found to inhibit Rhizoctonia."

Soils, W. H. HARRISON (*Ann. Rpt. Bd. Sci. Advice India, 1917-18, pp. 5, 6*).—Soil surveys in Bengal indicate that the soils of Bengal are divided into old alluvium or red laterite and new alluvium or silt, which differ widely. The former are in many cases almost sterile and are normally very deficient in lime and phosphoric acid. Potash is a limiting factor for certain crops. The silts are deficient in nitrogen, but are fairly well supplied with lime, phosphoric acid, and potash.

Studies on certain acid soils of Burma to determine the power of these soils to absorb lime from bicarbonate solutions in the presence of carbon dioxid have shown the lime absorption to be, within moderate limits of dilution, a function of the ratio of lime in solution to carbon dioxid in solution. "The experiments indicated that the method adopted furnished a means of estimating the lime requirements of soils, and have shown further that the absorption by the mineral and organic constituents is similar in character."

Soil survey and forest physiography of Kuitpo, South Australia, E. O. TEALE (*Dept. Forestry, Univ. Adelaide* [*So. Aust.*], *Bul. 6* (*1918*), *pp. 19, pls. 5*).—This survey deals with the soils and geology of a forested area of about 5,000 acres near Adelaide, New South Wales. The area is part of a broad mature valley and the lowest portions are poorly drained. The soils vary from loose sand to fine textured sandy clay with light colored sandy loam on slopes and ridges. The area as a whole is characterized by an impervious, ferruginous, clay subsoil. With reference to the content of plant nutrients the soils are classed as poor.

"Potash, however, is perhaps slightly above the average proportion for soils of this grade. . . . From a tree-growing consideration, the plant foods appear to be sufficient for most species, and a noteworthy feature is evident that the soil most deficient in plant food, a loose sand, has yielded the best volume results for *Pinus insignis* in the forest areas. It is clear that texture, drainage, and aeration conditions in this case prove more important than the chemical contents of the soil.

"Considering the results of the mechanical analyses, most of the subsoils show a certain similarity with the exception of the loose sand. In general, they may be classed as moderately stiff sandy-clays which do not allow of ready downward movement of surface waters, and most of the variations in timber growth and native vegetation are probably attributable, in the main, to topographic features affecting drainage conditions."

Observations on soil erosion, W. TORRANCE (*Union So. Africa, Dept. Agr. Bul. 4* (*1919*), *pp. 16, pls. 18*).—Popular information on soil erosion in South Africa and its prevention by various means, including terracing, is given.

Chemical studies of soil cultivated in various ways, R. K. KRISTENSEN (*Tidsskr. Planteavl, 26* (*1919*), *No. 2, pp. 335–361*).—Experiments conducted at the Askov Experiment Station are reported, in which chemical analyses were made of samples of soil from fallow fields for several successive years to determine the effect of various methods of cultivation on the content of nitrogen, phosphoric acid, and organic matter.

It was found that the content of these substances depended closely upon the method of treatment, especially as a result of manuring and green manuring. The soil of manured plats contained 0.058 per cent nitrogen as against 0.046 per cent in the soil of unmanured plats. Green manuring with lupines without other treatment increased the nitrogen content to 0.062 per cent. Further studies of the accuracy of these experiments disclosed a mean error of from 2 to 3 per cent in analyses.

Experiments on the manuring of green crops carried out on tea estates (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 4* (*1918*), *pp. 87–121, pls. 5*).—Experiments on five different tea and grass soils within a comparatively restricted area to determine whether the response to different fertilizers varies for the same type of fertilization are reported.

Lime was applied alone in only two cases, and in neither case was any great benefit derived. The injurious effect of magnesia when added with ammonium sulphate was greater in the one of two soils which had the higher lime-magnesia ratio. Additions of lime and ammonium sulphate gave better results than lime alone in one case and poorer results in another.

The effect of potash manures was more marked than that of either lime or ammonium sulphate. In three cases very poor results were obtained with heavy dressings, and in one case very good results were obtained. This difference in behavior of potash did not appear to be correlated with any great difference in the chemical composition of the soils. A slight increase in crop was obtained in all cases from small dressings of potash.

On the estates at which the heavy dressings of potash resulted in a failure, phosphatic manures were found to be a success, while where the heavy dressings of potash were very successful the effect of the phosphatic manuring was negligible. The results are taken to indicate that phosphatic manuring was more successful on grassland than on abandoned tea land, and that the increases due to lime, ammonium sulphate, and small dressings of phosphate are not markedly different.

[Fertilizer experiments], L. C. HARLOW (*Ann. Rpt. Sec. Agr. Nova Scotia, 1918, pt. 1, pp. 151, 152*).—Pot experiments with corn showed that the best results were obtained with stable manure and basic slag used together. Basic slag alone also gave good results on muck soil. Rock phosphate gave good results when combined with such organic materials as manure and kelp, but no results alone. An experiment with by-product lime, containing 68.4 per cent calcium carbonate and traces of alkali, on upland loam soil with cabbage and oats showed that this material was very beneficial.

Fertilizer tests on the old experimental field at Sappemeer in the years 1881 to 1915, A. G. MULDER, C. MEIJER, and J. HUDIG (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefsta.* [*Netherlands*], *No. 22* (*1918*), *pp. 127–170, figs. 3*).—Tests of stable manure alone; complete fertilization with nitrogen in the form of either sodium nitrate or ammonium sulphate; complete fertilization except one of potash, phosphoric acid, or nitrogen; half stable manure and half artificial fertilizers; and one of nitrogen, phosphoric acid, or potash alone on peat soil with oats, potatoes, beans and rye extending from 1881 to 1915, inclusive, are reported.

It is generally concluded that peat soil rich in humus is not injured by alternate fertilization with acid and alkaline artificial fertilizers, and that it can remain in a highly productive state under such treatment for 35 years and be even more productive than by continuous treatment with stable manure. Exclusively acid fertilization without additions of lime reduces the productiveness of the soil. Stable manure alone showed no advantage over artificial fertilizers. A combination of stable manure and artificial fertilizer or an alternating use of the two gave as little profit.

On the basis of the nutritive needs of the crops potatoes, rye, and oats, it is concluded that none of the three main constituents, phosphoric acid, nitrogen, and potash, of artificial fertilizers can be omitted without injuring production. It was found that the use of stable manure caused a good crop of potatoes the first year, but that the following crop, rye or oats, was usually undernourished. Complete fertilization with nitrogen as sodium nitrate gave the best all-around results.

An experiment in nitrogen losses, L. C. HARLOW (*Ann. Rpt. Sec. Agr. Nova Scotia, 1918, pt. 1, pp. 152–154*).—Experiments on an uncropped red sand soil, practically destitute of organic matter, to which manure was added, alone and with each of the materials burnt lime, ground limestone, and gypsum, showed a loss of nitrogen in all cases except where the ground limestone was used with the manure. Burnt lime reduced nitrogen loss to one-third of that occurring where the manure was added alone.

Production costs of Chilean nitrate, J. MARCO (*Jour. Indus. and Engin. Chem., 11 (1919), No. 8, pp. 780, 781*).—Data are reported on the cost of producing Chilean nitrate with reference to competition with synthetic nitrogen.

The cost of mining and transportation of the raw product to the extraction plant is estimated at from 79 cts. to $1.40 per short ton. The cost of extraction per short ton is 90 cts. to $1.31, of which the principal factors are labor 30, fuel 60, and technical control less than 1 per cent. The costs of transportation from the extraction plant and placing on board ship are about $18 per short ton of commercial nitrate. The administration costs are approximately 38 cts. to 60 cts. per short ton of raw material.

"Technical control and advice have been practically forgotten in the Chilean nitrate industry on account of the control of the nitrate markets which the Chilean industry has heretofore maintained. There is no question but that technical control and advice will lower costs. Some plants, for example, now extract no more than 55 per cent of the nitrate contained in the material, while others, in exceptional cases, get as high as 72 per cent. There is, however, a change taking place in this respect. Chemists and other technically trained men are being engaged in research which will undoubtedly lead to an increase in the percentage extracted and to a reduction in the amount of fuel used."

Equilibrium studies upon the Bucher process, J. B. FERGUSON and P. D. V. MANNING (*Jour. Indus. and Engin. Chem., 11 (1919), No. 10, pp. 946–950, figs. 3*).—Experiments on the Bucher process of nitrogen fixation, using pure chemicals and mixtures of pure nitrogen and carbon monoxid in known proportions, are reported. Curves are deduced showing (1) the relation between the carbon monoxid content of the furnace gases and the yield of cyanid, and (2) the relation between the carbon dioxid content of the furnace gases and the yield of cyanid, both at two temperatures. These indicate that under certain conditions producer gas may be used in the process, and that the dissociation of sodium carbonate is probably one of the controlling chemical reactions.

Potash recovery at cement plants, A. W. G. WILSON (*Jour. Soc. Chem. Indus., 38 (1919), No. 15. pp. 314T–318T*).—This article deals briefly with methods and cost of potash recovery in cement plants.

Various potash fertilizers on corn, L. C. HARLOW (*Ann. Rpt. Sec. Agr. Nova Scotia, 1918, pt. 1, pp. 154–156*).—Pot experiments, to compare nepheline rock and high and low-grade flue dust with potassium chlorid as sources of potash for corn on white sand soil mixed with raw peat, showed that the three materials, while not comparable to potassium chlorid, have a value as sources of potash. The ground nepheline rock appeared considerably superior to the flue dusts.

The phosphate nodules of Overijssel and the phosphorite meal obtained therefrom as a direct fertilizer, D. KNUTTEL and M. J. VAN'T KRUYS (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefsta.* [*Netherlands*], *No. 23* (*1919*), *pp. 167–177*).—This article reports studies on the origin, occurrence, form, chemical composition, and solubility in water containing carbon dioxid of the so-called phosphorite meal obtained by grinding natural phosphate nodules occuring naturally in Overijssel, Holland.

It was found that the phosphoric acid of this meal was only about 70 per cent as soluble in water containing carbon dioxid as that of Algerian phosphate. An advantage of the phosphorite meal is its small content of calcium carbonate. It has a relatively high iron content. It contains about 12 per cent phosphoric acid soluble in strong acids, of which 40 to 50 per cent is soluble in 2 per cent citric acid.

Studies on the speed of solubility of the phosphoric acid of Thomas meal and some other phosphates by continuous extraction with water containing carbon dioxid, J. G. MASCHHAUPT (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefsta.* [*Netherlands*], *No. 23* (*1919*), *pp. 57–84, pls. 1, figs. 4*).—An apparatus for conducting the continuous extraction experiments is described. Results of extraction experiments with different phosphates are reported, and compared with the results of extraction with 2 per cent citric acid and of intermittent extraction with water containing carbon dioxid, and with the known availabilities of the phosphates from cropping experiments.

The results appear to be contradictory, and it is concluded that new and more exact fertilizer experiments are necessary before it can be assumed that speed of solubility is a good measure of the availability of a phosphate.

Various phosphate fertilizers on clover, L. C. HARLOW (*Ann. Rpt. Sec. Agr. Nova Scotia, 1918, pt. 1, pp. 156–158*).—Comparative fertilizer experiments with filter press mud from sugar refineries, basic slag containing 12.8 per cent citrate soluble phosphoric acid, and basic slag containing 2 per cent citrate soluble phosphoric acid, on white sand soil mixed with raw peat and growing clover, showed that the filter press mud gave nearly as good results as acid phosphate, and that the nitrogen present in it took the place of that in sodium nitrate to a large extent. The first-mentioned basic slag gave as good yields of clover as acid phosphate, but those from the second basic slag were in no way comparable.

An experiment on the solubility of rock phosphate, L. C. HARLOW (*Ann. Rpt. Sec. Agr. Nova Scotia, 1918, pt. 1, p. 162*).—Studies on the citrate solubility of rock phosphate which had been calcined with finely ground gypsum showed negative results due to calcination. The rock phosphate was, however, much less soluble when calcined alone than when calcined with gypsum.

Experiments with sulphur and rock phosphate, L. C. HARLOW (*Ann. Rpt. Sec. Agr. Nova Scotia, 1918, pt. 1, pp. 158–162, pl. 1*).—Pot experiments with clover and oats on virgin soil to determine the effect of the addition of sulphur on the solubility of the phosphate of raw rock phosphate showed that the crop failed where sulphur was used, except when lime was also added. It was found that the sulphur was changed to sulphuric acid in the soil to quite an extent, and the failure of the crops is attributed to this cause. However, the percentage of citrate soluble phosphoric acid was not increased where sulphur was added.

Phosphorites and superphosphates from the point of view of the sulphur industry, L. Tirelli (*Chem. News, 118 (1919), No. 3070, pp. 73–76*).—This article deals with the utilization of the sulphurous acid escaping from sulphur smelting furnaces by combining it with insoluble mineral phosphates, with a view to obtaining superphosphates. The work of others bearing on the subject is reviewed, and experiments reported which showed in a general way that "sulphurous anhydrid only reacts at the surface of the particles of phosphorite, producing especially the bibasic salt, and that this is the limit of the action . . . It is clearly evident that one can not reckon on an eventual conversion of sulphurous anhydrid into sulphuric anhydrid by the action of porous phosphorites in the presence of oxygen. If such an action is produced it is limited to the surface, as occurs when oxid of calcium is used. It is therefore useless to examine the considerable and numerous difficulties which would offer themselves to the practical realization of this process, which has no chance of success."

The action of lime in the soil, J. Hughes (*Jour. Bath and West and South. Counties Soc., 5. ser., 13 (1918–19), pp. 34–45*).—Experiments on the action of lime and magnesia in Rothamsted Woburn, and Herefordshire soils are summarized.

It was found that caustic lime, when mixed with air-dried red hop-yard soil and loam soil, was converted into carbonate much more slowly than when the soils were moist. With reference to the relative solubility of caustic lime and calcium carbonate, it was found that "caustic lime dissolves readily in a very small quantity of cold water compared with carbonate of lime. . . . A larger quantity of cold boiled distilled water is required to dissolve one part of carbonate of lime than is the case with the unboiled cold distilled water, because distilled water, as it comes from the condenser, contains a varying amount of carbonic acid which increases the solvent action of the water."

The general results of experiments at Woburn indicated that "though the application of magnesia to soils deficient in this ingredient may increase the yield of wheat, more economical results will be obtained if the alkalinity of the soil be increased by the application of lime, either in small quantity as finely ground caustic lime at about 10 cwt. per acre, or as finely ground chalk or limestone in larger proportion, namely, 1 to 2 tons per acre. . . . In conclusion, it may be safely assumed that where the percentage of lime is less than that of magnesia lime in some form is requisite. Also, that when the percentage of lime exceeds that of magnesia but is less than 1 per cent in the air-dried soil, the application of lime is generally desirable and likely to be attended with beneficial results."

In studies of the relations between lime and magnesia in 11 specially selected Herefordshire soils, lime and magnesia soluble in hydrochloric acid were determined in all of the soils, carbon dioxid in the 2 soils Nos. 5 and 7 that contained the most lime, and sulphuric acid and chlorin in the soils containing the most magnesia. It was found that magnesia was in excess of the lime in 8 of the 11 soils, and that in the soils containing the most lime the percentage of carbon dioxid was not sufficient to combine with the whole of the lime.

It is concluded that "(1) the lime in these soils exists partly as carbonate, which is available as plant food, and partly as silicate of lime, which is not so readily available; (2) the magnesia exists not as carbonate, sulphate, or chlorid, but as silicate, in which state it is not likely to be readily available either as plant food or as a nitrifying agent in the soil; (3) it is not the excess of magnesia in certain of these soils but the deficiency of lime that has caused the crop results on such soils to be unsatisfactory; (4) all the soils, with the exception [of] 5 and 7, will be greatly benefited by the application of lime; and (5) as all these red sandstone soils contain only a moderate amount of vegetable matter in the form of humus, lime would be more suitably supplied in the form of finely ground limestone or chalk, or as precipitated carbonate of lime from water works or paper manufactories, than as freshly burned quicklime, which would tend to burn up or too rapidly oxidize the humus which constitutes such a valuable ingredient of all fertile soils."

The carbonation of burnt lime in soils, W. H. MacIntire (*Soil Sci., 7 (1919), No. 5, pp. 325–453, figs. 16*).—This paper reviews the work of others bearing on the subject, reports preliminary chemical studies of the carbonation of calcium oxid and calcium hydrate without introducing the factor of the influence exerted by soils, and reports an extensive series of experiments begun at the Tennessee Experiment Station and finished at Cornell University on carbonation subsequent to the application of lime to soils.

"The experiments as a whole point to certain definite facts which have practical application. Among these are the following: CaO and Ca $(OH)_2$ in 2 to 4-ton applications will revert to the carbonate more rapidly when left on the soil surface than when mixed with a dry mulch or the moist soil. If an oxid or hydrate application is left on the soil surface for several days prior to inworking, the treatment is in effect an application of finely divided $CaCO_3$. Surface application of oxid and hydrate will, for the most part, revert to the carbonate more rapidly during humid atmospheric conditions.

"If the oxid or the hydrate is incorporated within the upper zone of the soil, prior to a more thorough dissemination throughout the soil, the concentration thus effected will bring about in the treated zone a temporary and partial sterilization which may have certain beneficial results. The avidity, or affinity, of CaO is for moisture, and when this is furnished by the aerial and soil atmospheres and by soil moisture, there is no tendency to effect any chemical disintegration of soil organic matter. Neither CaO nor $Ca(OH)_2$ can be considered as chemically destructive of soil organic matter when used in the manner and in the amounts to be considered as practical applications."

Field experiments with by-product lime and marls containing magnesia, Tacke (*Hannover. Land u. Forstw. Ztg., 1918, No. 3–4; abs. in Zentbl. Agr. Chem., 48 (1919), No. 4, pp. 129–133; Jour. Soc. Chem. Indus., 38 (1919), No. 14, p. 507A*).—Field experiments with different crops on newly cultivated moor and heath soils indicated that there is no particular value in the high magnesium content of by-product lime. Its value lies in its content of basic materials. In all cases it gave smaller results than finely ground lime marl, even though it was finely ground. The price of by-product lime is also considered much too high in comparison with other liming agents.

A chemical investigation of the mussel mud deposits along the north shore of Nova Scotia, L. C. Harlow (*Ann. Rpt. Sec. Agr. Nova Scotia, 1918, pt. 1, pp. 141–145*).—The results of chemical analyses of 13 samples of mussel mud deposits are reported which indicate that their value as sources of fertilizer material varies considerably with different deposits. It is concluded that the value of these muds does not warrant the expense of transporting them any distance inland.

Fertilizers (*Almanach Soc. Sultan. Agr., 2 (1918), pp. 219–253, pl. 1, figs. 4*).—This article deals in general with the production, composition, and manner and extent of use of natural and artificial fertilizers in Egypt.

General regulations governing licensees engaged in the business of importing manufacturing, storing, or distributing fertilizers and fertilizer ingredients (*U. S. Dept. Agr., Off. Sec. Circ. 145* (*1919*), *pp. 4*).—The text of the regulations promulgated by the President under the Food Control Act of 1917 is given.

AGRICULTURAL BOTANY.

Fundamental questions in the study of vegetations, H. Gams (*Vrtljschr. Naturf. Gesell. Zürich, 63* (*1918*), *No. 3–4, pp. 293–493, figs. 7*).—This is a critical review, with extensive bibliography, of the concepts and methodology employed in the study of plants in societies, here designated as biocœnology (Biocœnologie) as opposed to the study of plants as individuals, designated as idiobiology (Idiobiologie).

Some western species of Lathyrus, C. V. Piper (*Proc. Biol. Soc. Wash., 31* (*1918*), *pp. 189–196*).—In connection with economic investigation of Lathyrus, some western species have been critically studied. Several of these show wide variation in characters of the leaflets, stipules, and tendrils. Pubescence seems to be a fairly stable character. New species noted include *L. ochropetalus* and *L. peckii;* new subspecies, *L. ochropetalus holochlorus* and *L. coriaceus aridus;* and new combinations, *L. nuttallii lanceolatus*, *L. pauciflorus utahensis*, *L. pauciflorus schaffneri*, and *L. pauciflorus brownii.*

Report of the committee on generic types of the Botanical Society of America, A. S. Hitchcock (*Science, n. ser., 49* (*1919*), *No. 1266, pp. 333–336*).—This report, submitted at the Baltimore meeting of the Botanical Society of America, contains the regulations proposed for fixing generic types.

Recent studies on Œnothera, E. Lehmann (*Ztschr. Bot., 10* (*1918*), *No. 9, pp. 517–551*).—This is a bibliographical review of recent studies and opinions regarding the origin, meaning, and transmission of characters observed in species of Œnothera.

Reciprocal hybrids between Epilobium roseum and E. parviflorum, E. Lehmann (*Ztschr. Bot., 10* (*1918*), *No. 9, pp. 497–511, figs. 7*).—This is an account of studies, which are to be extended, on reciprocal hybrids between *E. roseum and E. parviflorum.*

The significance of foliar glands in peach, C. Campbell (*Atti R. Accad. Lincei, 5. ser., Rend. Cl. Sci. Fis., Mat. e Nat., 27* (*1918*), *I, No. 11, pp. 410–413*).—In a preliminary note the author discusses foliar glands as of probable use in connection with the determination of genetical relationships among certain stone fruits.

Physiological characters of summer and winter annuals, particularly cereals, G. Gassner (*Ztschr. Bot., 10* (*1918*), *No. 8, pp. 417–480, pls. 2, figs. 7*).—This is a detailed account of study during several years on annuals, particularly rye and barley, as related to the influence of cold and of temperature variations and of other factors, including hereditary tendencies.

Light and growth.—III, The explanation of phototropism, A. H. Blaauw (*Meded. Landbouwhoogsch.* [*Wageningen*], *15* (*1919*), *No. 3–5, pp. 87–204, pls. 3, figs. 7*).—In a continuation of work previously noted (E. S. R., 35, p. 129), the author has given attention to phases of phototropism as studied chiefly in *Phycomyces nitens*, *Helianthus globosus*, *Pepidium sativum*, *Raphanus sativus*, *Sinapis alba*, and *Avena sativa*.

The evidences obtained are considered to indicate that phototropism as seen in cases of unilateral illumination is a manifestation of localized growth response to light influence. The light reaction seems to be confined to zones, particularly cells or certain parts of cells. It is thought that recognition of this claim as a fact eliminates the problem regarding phototropism as such, this phenomenon being simply a secondary phenomenon to which growth reaction is primary.

The influence of light on growth in coleoptiles of Avena sativa, H. Sierp (*Ztschr. Bot., 10 (1918), No. 11, pp. 641–729, figs. 16*).—Noting the view, frequently stated, but opposed by results obtained by Vogt (E. S. R., 32, p. 129) and by Blaauw (E. S. R., 35, p. 129), namely that growth is favored by darkness and checked by light, the author has carried out some related work which is here detailed.

It was found that in the coleoptile of *A. sativa* growth was first increased by increase of illumination, and that this was followed by a decrease in growth. With high or low ranges of intensity of illumination, the curves become somewhat complicated.

As a general result of this work it is stated, with discussion, that the final length of the coleoptile depends upon the intensity and the time of exposure to light in such a way that the longer the least effective of the light intensities is applied, and the smaller the sum of illumination intensities, the larger is the resulting coleoptile.

The action of vegetable enzyms on some organic substances, G. Ciamician and C. Ravenna (*Atti R. Accad. Lincei, 5. ser., Rend. Cl. Sci. Fis., Mat. e Nat., 27 (1918), II, No. 9–10, pp. 293–300*).—In the present note, the authors have summarized facts considered as significant which they have set forth in articles previously noted (E. S. R., 39, p. 526). They present also data claimed to give support to the hypothesis that plants possess in certain accessory substances the means adequate to eliminate organic refuse.

Etherization of tissues and its effect on enzym activity, W. W. Bonns (*Ann. Missouri Bot. Gard., 5 (1918), No. 4, pp. 225–299*).—This is a review, with copious bibliography, of the literature of plant response to anesthetics, followed by an account of experimental investigations.

The data obtained lead to the conclusion that the presence of a colloidal enzym-protein complex or of solid organic matter, such as meal or flour from tissues, may introduce a source of material error. The experiments with barley indicate that inhibiting enzym action, after freeing the substrate from insoluble organic matter, tends to give more concordant results. The results obtained tend as a whole to confirm the view that anesthetics exert a somewhat direct influence upon the subsequent activities of plant enzyms.

Studies on anthocyanin metabolism based on chemical characters of the anthocyanin group, K. Noack (*Ztschr. Bot., 10 (1918), No. 10, pp. 561–628*).—A systematic and detailed account is given of work done in connection with *Polygonum compactum* and species and varieties of *Pæonia;* the physiological significance of isomerization in relation to anthocyanin; and chromogens yielding coloring matters resembling anthocyanin.

Anthocyan and respiratory exchanges in leaves, G. Nicolas (*Compt. Rend. Acad. Sci. [Paris], 167 (1918), No. 3, pp. 130–133*).—As a result of work done with a number of plants indicated, the author states that leaves which are reddened by conditions that may be called accidental, or which, being red while young, turn green later, have a respiratory intensity higher than that of green leaves of the same species; while leaves which are normally red have a respiratory intensity less than that of green leaves of the same kind. In general, the respiratory quotient is lower in red than in green leaves.

The relation between anthocyanin formation and respiratory oxidation is said to be indirect, involving the activity of other substances produced, including organic acids.

On transpiration from leaf-stomata, H. Jeffreys (*Phil. Mag. and Jour. Sci., 6. ser., 35 (1918), No. 209, pp. 431–434*).—This is a reply to the discussion by Larmor previously noted (E. S. R., 39, p. 631), together with a brief rejoinder by that author.

Developmental history of the leaf, O. Schüepp (*Vrtljschr. Naturf. Gesell. Zürich, 63 (1918), No. 1-2, pp. 99-105, figs. 3*).—Describing the different developmental phases of elements of maple (*Acer pseudoplatanus*) leaves, the author claims that bud formation is a reaction to unfavorable conditions as regards nutriment.

The developmental history of budding, O. Schüepp (*Vrtljschr. Naturf. Gesell. Zürich, 63 (1918), No. 1-2, pp. 106-115, figs. 4*).—Data have been collected from studies of different plants in regard to the development and arrangement of buds and resulting shoots.

Minor teratological phenomena, G. Lakon (*Ztschr. Pflanzenkrank., 26 (1916), No. 1, pp. 46-48, figs. 3*).—A double tomato fruit is discussed as to structure and relations.

Anatomical and physiological study of leaf cast, P. J. Pujiula (*Broteria, Ser. Bot., 16 (1918), No. 2, pp. 71-83, figs. 6*).—A study of *Rhamnus alaterna* and of *Ligustrum japonicum* is described.

Excess of water is said to cause or accelerate leaf cast. This is said to be due directly to the gelatinization of histological elements in the absciss zone of the leaf stem, which may be noted previously in Ligustrum but not in Rhamnus. It may appear that a function which is normal or quasi normal in the leaf undergoes modification in the presence of water.

Criteria of ripeness in beets, J. Bernatsky (*Ztschr. Pflanzenkrank., 26 (1916), No. 1, pp. 37-46, figs. 4*).—Among the criteria of ripeness in beets is mentioned sensitivity to disease originating exteriorly or interiorly to the plant. A certain relation is claimed to exist between ripening of the root and the presence of Botrytis.

The physiologically acid and alkaline salts and their importance in the explanation of soil sickness, J. H. Aberson (*Cultura, 29 (1917), No. 341, pp. 21-43, pls. 10*).—This concludes the contribution previously noted (E. S. R., 36, p. 514). Soil sickness is said to be due to the presence of nitrous salts in the soil resulting from the activity of *Bacillus nitrosus*.

The cause of soil sickness, B. Sjollema (*Cultura, 29 (1917), No. 341, pp. 334-339; 30 (1918), No. 356, pp. 133-135*).—These two contributions constitute mainly a critical review of the work and views of Aberson as noted above.

The influence of electrolytes on the electrification and the rate of diffusion of water through colloidal membranes, J. Loeb (*Jour. Gen. Physiol. 1 (1919), No. 6, pp. 717-745, figs. 6*).—As a result of this work, noted here for its bearing on the behavior of plant membranes, the author states that when pure water is separated by a collodion membrane from a watery solution of an electrolyte the rate of diffusion of water is influenced by electrical forces as well as by gas pressure.

Water is in this case attracted by the solute as if the molecules of water were charged electrically, the sign of the charge of the water particles as well as the strength of the attractive force being expressed by two rules. According to the first of these, solutions of neutral salts possessing a univalent or bivalent cation influence the rate of diffusion of water through a collodion membrane, as if the water particles were charged positively and were attracted by the anion and repelled by the cation of the electrolyte. The attractive and repulsive action increases with the number of charges of the ion and diminishes inversely with a quantity here designated arbitrarily as the radius of the ion. The same rule is said to apply to alkali solutions.

According to the second rule, solutions of neutral or acid salts possessing a trivalent or tetravalent cation influence the rate of diffusion of water through a collodion membrane as if the particles of water were charged negatively and were attracted by the cation and repelled by the anion of the electrolyte. Solutions of acids obey the same rule, the high electrostatic effect of the hydrogen ion being due presumably to its small ionic radius. It is claimed that experiments on electrical osmose prove the correctness of the assumption.

A method is given by which the strength of the attractive electric force of electrolytes on the molecules of water can be roughly estimated, the results of measurements so made being in agreement with the above rules. A tentative explanation is offered regarding the fact that electrical attraction of water caused by the electrolyte increases with increase in the concentration of the electrolyte, but at low concentrations more rapidly than at high concentrations. The rate of diffusion of an electrolyte from a solution to pure solvent through a collodion membrane seems to conform largely to the kinetic theory.

The relation between the osmotic pressure of Nereocystis and the salinity of the water, A. M. Hurd (*Pubs. Puget Sound Biol. Sta., Univ. Wash., 2 (1919), No. 44–46, pp. 183–193*).—The author finds that the osmotic pressure of *N. luetkeana* is intimately connected with the concentration of the sea water, decreasing as the water becomes less saline. This plant, though intolerant of a sudden change to fresh water, can be adapted thereto if the cell sap be given time to approximate such medium in concentration. The osmotic pressure of Nereocystis is normally 22.72 atmospheres in normal sea water, but it was safely lowered to 12.52 atmospheres in water 17/28 fresh, beyond which the experiment did not extend. Throughout the course of adaptation, the osmotic surplus of Nereocystis is 3.62 atmospheres. The lowering of osmotic pressure in the plant is effected by removal of the salts and intake of water.

The evaluation of the nutritive solution of von der Crone, M. Appel (*Ztschr. Bot., 10 (1918), No. 3, pp. 145–158*).—The author details a study carried on during three years, of the nutritive solution recommended by von der Crone (E. S. R., 18, p. 21), as tested in connection with corn and buckwheat. It is stated that the latter, which is not very sensitive, thrives as well in any other well regulated nutritive medium, but that plants sensitive to acid and stringently requiring iron, as corn, develop specially well in the solution of von der Crone.

Daily periodicity in nuclear and cell division, G. Karsten (*Ztschr. Bot., 10 (1918), No. 1, pp. 1–20, figs. 3*).—Studies described as carried out with organisms representing a wide range of types are considered to support the view that in the Conjugatæ at least, the vegetative cells have become so adapted that during daylight hours they assimilate carbon dioxid and store energy, which during the hours of darkness they give up to promote growth. Daylight seems to hinder cell (nuclear) partition.

Phytobiochemical studies, A. Zlataroff (*Biochem. Ztschr., 75 (1916), No. 3, pp. 200–210, figs. 2*).—This is a preliminary report embodying phases of studies still in progress on the transformations of nitrogen- and phosphorous-containing substances during the germination of plants.

Sporulation by symbiosis in fungi, A. Sartory (*Compt. Rend. Acad. Sci. [Paris], 167 (1918), No. 8, pp. 302–305*).—The author, having succeeded previously, by utilizing the presence of a bacterium, in producing sporulation in yeast, also perithecia in *Aspergillus* sp., reports later experimentation on the same fungus in connection with bacteria.

It was found that bacteria favor the formation of perithecia, and that this is not dependent upon temperature. The part played by the bacteria is, apparently, to cause changes in the substratum favorable to the formation of perithecia.

FIELD CROPS.

Tillage: A review of the literature, M. C. Sewell (*Jour. Amer. Soc. Agron., 11 (1919), No. 7, pp. 269–290*).—In this paper, a contribution from the Kansas Experiment Station, the author reviews literature dealing with the early history and philosophy of tillage, the preparation of seed beds, and the cultivation of crops, including the effect on soil moisture, nitrification, yield, and aeration. In general it is concluded that "the prevailing theories advocating deep plowing and frequent cultivation are not founded upon experimental evidence."

Plowing deeper than 7 in. has not generally increased crop yields, while shallow plowing may produce as high a yield as deeper plowing. The best depth of plowing of less than 7 in. has not yet been determined. The best frequency of plowing has not been ascertained, but it is believed possible to lessen the number of plowings by a proper rotation of crops. The evidence is held to indicate that cultivation may be necessary only to kill weeds and to render the soil receptive to rainfall.

A bibliography of 70 titles is appended.

[Report of field crops work in Assam], J. McSwiney (*Rpt. Agr. Dept. Assam, 1919, pp. 3–6*).—In continuation of work previously noted (E. S. R., 40, p. 523), this describes variety, fertilizer, and cultural tests with sugar cane, variety and selection tests with rice, and variety tests with potatoes. Field tests with jute and miscellaneous forage crops are also mentioned.

[Report of field crops work in Bengal, 1917–18], F. Smith et al. (*Rpt. Agr. Dept. Bengal, 1917–18, pp. 2–5, 7–9; Ann. Rpts. Expert Off. Dept. Agr. Bengal, 1917–18, pp. 5–25, 27, 28, 30–32, 35, 36, 39, 40, 41, 42, 49, 50, 54–57, 59, 60, 61, 62, 66–71, 73–79, 82–90*).—Variety, cultural, and fertilizer tests with jute, rice, corn, potatoes, sugar cane, and miscellaneous field crops, conducted at various experimental centers in Bengal, are described.

[Report of field crops work in the Central Provinces and Berar, India, 1918], R. G. Allan et al. (*Dept. Agr. Cent. Provs. and Berar [India], Rpt. Expt. Farm, Agr. Col., Nagpur, 1918, pp. 2–11; Rpt. Agr. Stas. West. Circle, 1918, pp. 2–15; North. Circle, 1918, pp. 4–17, 20–23, 25–31, pl. 1; South. Circle, 1918, pp. 3–16, 22–30, 36–48, 63–66*).—In continuation of similar work previously noted (E. S. R., 40, p. 523), these reports describe variety, cultural, rotation, and fertilizer tests with sugar cane, rice, wheat, cotton, gram, and miscellaneous field crops conducted on numerous experimental farms in Central India.

[Rotation and culture experiments], A. Sjöström (*Red. Ultuna Landtbr. Inst. [Sweden], 1918, pp. 32–45*).—The yields in 1918, and in part for the period 1909–1918, of cereal, root, and forage and pasture crops grown in 8-year rotations on clay soil are briefly reported.

Bore wheat for the years 1909–1918 gave an average yield of 43.64 bu., and Petkus rye for the same period an average of 45 bu. per acre. Barley grown after beans gave much better yields in 1918 than when grown after winter wheat. The average yield of barley following root crops for the years 1910–1917 was 53.8 bu. per acre. Oats also yielded better after beans than after winter wheat. In 1918, increasing the quantity of seed per acre by 44 lbs. above normal increased the yield of rye 170 lbs. and the yield of wheat 71 lbs. per acre.

[Experiments with wheat, oats, rye, and root crops], R. Torssell (*Red. Ultuna Landtbr. Inst. [Sweden], 1918, pp. 74–97, figs. 2*).—The experiments here reported were conducted at Ultuna, Linköping, and Kungsängen.

The yields secured in variety tests at Ultuna in 1917–18, together with the average yields for earlier periods of a number of years each, are tabulated and discussed. Varieties of winter wheat, largely hybrids and their parents, were tested from 1911–1916, inclusive, and the average yields showed that varieties from southern Sweden lacked hardiness in that latitude. It was observed that the varieties Sol II and 0912 Sol III showed a rather high degree of winter resistance, while their parents Sol I and Extra Squarehead II sustained winter injury to a quite perceptible degree. Many of the earlier and hardier varieties exhibited marked resistance toward the stalk disease of wheat, but this relationship was not sufficiently constant to assume that these factors are generally associated, and it is believed that stalk-disease resistance in wheat is a character independent of earliness and hardiness. In a variety test conducted at Linköping in 1918 Thule, 0865 Birgitta, and 0860 Fylgia wheat were most resistant to the stalk disease. The results in general also showed plainly the effect of this disease in reducing both yield and quality.

In variety tests with rye the highest average yield for the years 1906–1918 was secured from Stjärn and Petkus, which yielded respectively 14.9 per cent and 11.2 per cent more grain than was obtained from Ultuna Common, the variety generally grown in the locality. Among the newly originated varieties No. 0280, a strain of Professor Heinrich rye, ranked high in yield and stood first in weight per hectoliter in 1917 and second in 1918 in 15 trials of nearly as many varieties.

Observations on inheritance in lupines, wheat, and barley, H. A. B. Vestergaard (*Tidsskr. Planteavl, 26 (1919), No. 3, pp. 491–510, figs. 7*).—Crosses were made with three different strains of blue lupine (*Lupinus angustifolius*), comprising blue, red, and white flowered types. A cross made in 1912 between the white flowered type as the female parent and the blue flowered type resulted in a blue flowered hybrid, which produced in the F_2 generation in 1914 a progeny segregating in the ratio of three blue to one white flowered plant. This result is construed as indicating the presence of a factor determining the blue color of the blossom in the one parent and its corresponding absence in the other. Seeds of three of these white flowered individuals planted in 1915 produced only white flowered progeny, while seeds of four of the blue flowered plants gave 55 blue flowered and 15 white flowered individuals, or a ratio of nearly 3:1.

A cross made in 1912 between the white flowered type as the female parent and the red flowered type resulted in a blue flowered hybrid which gave in the F_2 generation a progeny representing a ratio of 9 blue flowered, 3 red flowered, and 4 white flowered individuals. A duplicate of this cross gave similar results. It is pointed out that the number of blue flowered and red flowered plants and of white flowered plants are to each other as 3:1, and that the same ratio holds between the blue flowered and the red flowered individuals. It is further stated that the proportion 9:3:3:1 is typical of the F_2 generation in the presence of two pairs of characters or of two different unit characters and their absence. The conclusion is drawn that the white flowered plants used in crossing included a factor for blue which remained suppressed, and that the group of four white flowered plants is made up of three containing this factor for blue and of one with the factor for white flowers in pure form. Similar results, it is shown, were secured in experiments with the flat pea, mangels, and sugar beets when the factors determining flower color were in the same conditions and relationships.

A cross of the blue flowered on the red flowered type of blue lupine gave in the F_2 generation a ratio of three blue flowered plants to one plant with red flowers. In another instance three red flowered plants fertilized with pollen from blue flowered plants produced three pods containing 2, 3, and 3 seeds, respectievly. All of these seeds gave rise to blue flowered plants except one which produced a red flowered individual. In order to determine whether the red flowered hybrid would produce red flowered plants or whether segregation would take place, a row of 12 seeds was planted and compared with similar rows of the blue flowered hybrids. It was found, however, that the seeds from the red flowered hybrid produced seedlings with quite well developed roots but with very abnormal rudiments of stems and leaves which failed of growth. The seeds from the other hybrids all produced normal plants.

Seeds of seven plants with abnormal spikes found in 1916 in a pure line of two-rowed barley planted in 1917 gave 36 similarly abnormal plants and four apparently normal ones. The seeds of 10 of the abnormal individuals planted in 1918 resulted in progeny presenting the same abnormality throughout, while seeds of two of the apparently normal individuals segregated in the ratio of 3.35 normal plants to one abnormal individual. It is concluded, therefore, that the normal appearing plants were of a hybrid nature of independent Mendelian segregation in which the normal character was dominant. In 1919 the abnormal character again was found constant. The pure line in which the abnormal plants was originally observed was cultivated in 1917 and 1918, but no more plants of this particular type were found.

In 1914 a mutant characterized by long loose spikes was found in a pure line of about 50 plants of Storaks wheat. This plant produced 92 kernels, which were planted in 1915 and gave 27 normal plants and 27 with the long and loose type of spike. The progeny of the mutant was observed to have a longer straw and a smaller tillering capacity as compared with the normal form. In 1916, when 10 rows of each type were grown, the normal type produced only normal plants, while each row of the other type produced plants of both types. The individual rows showed marked variation in the proportion of the two types produced. The total number of plants was about equal, there being 163 individuals with long and loose spikes and 161 with normal spikes. In 1916–17 12 rows of the mutant form produced 105 normal plants and 78 plants with mutant spike characters, and in 1917–18 15 similar rows gave, respectively, 158 and 150 plants of the two forms. The seed of both types was found to germinate equally well and to produce viable seedlings. These results raised the question why some of the rows of the mutant form did not come true to type. In 1918 one of the 15 rows produced a single plant of the club-wheat type having a short stem and a very short, thickly-set spike with stiff chaff. In 1919 the seeds of this plant produced individuals representing the three types and in addition a dwarf form only 8 in. high and apparently barren.

Observations were made further to determine whether partial or total barrenness in wheat is a heritable character. In 1915 a plant was found having 7 strains, but with the spikes containing only 56 seeds or about one-fourth normal yield. The progeny of this plant comprised 25 partially or totally barren and 6 normally seed-producing individuals. The 25 abnormal plants produced only 2 grains capable of germination and these gave only poorly developed plants. The seed of 4 of the normally grain-producing plants was planted separately in 4 rows. The first row varied widely in height of stems and form of spike, and of the 23 plants produced 7 were totally barren, 12 partially so, and 7 were normal. Many of the plants seemed to give expression to certain characters of varieties which the year before had grown near the original plant. The second row showed less variation and also only a small degree of barrenness. In the third row nearly all plants resembled Storaks wheat, which grew the preceding year near the original form, and about one-half of the plants were partially barren. The plants of the fourth row were very much like Squarehead wheat and 25 per cent were partially barren. It is believed from these results that barrenness of wheat may be due largely to an incomplete development of the sexual organs of the plant.

In an otherwise constant line of two-rowed barley 3 dwarf-like variants were discovered. The yield as compared with 40 other lines was small. In 1915 this dwarf form was crossed with Binder barley, giving rise in 1916 to 2 plants having the character of Binder barley, the male parent. The progeny of these plants consisted of 95 individuals, of which 81 were of normal type like Binder barley and 14 were of dwarf form, giving the unexpected and unexplained ratio of 6 : 1. In 1918 seed from the dwarf form gave only dwarf progeny like the original, while seed of the hybrid type produced both normal and dwarf individuals. These results are taken as indicating that the dwarf form presented a mutation.

Root crop seed production in 1918 and the root crop seed trade in the winter of 1918–19, L. Helwig (*Tidsskr. Planteavl, 26 (1919), No. 3, pp. 511–537*).—Statistics are presented on the production in Denmark of seed of sugar beets, mangels, turnips, Swedish turnips, and carrots, and data are given relating to the trade in the seed of most of these crops prior to and during the war.

As reported, Denmark in 1918 devoted to seed production 25 hectares (61.75 acres) of sugar beets, 1,155 of mangels, 1,518 of Swedish turnips, 1,992 of turnips, and 1,010 of carrots. During the war the average annual yield of Barres and Bangholm mangels and yellow turnips was as a rule lower than the average yield for the years 1905–1914 and in some instances the reduction was quite marked. The financial returns for the period of the war were about double the returns during the preceding five years. From 1914 to 1918, inclusive, Denmark required for home use a yearly average of 2,482 tons of fodder beet seed, largely mangel seed, and had a surplus of 1,407 tons for the world's market.

The prosecutions in 1918 under the seed laws of the country are briefly reviewed, and the possibility and prospects of producing sugar beet seed for export are discussed. Data covering the 14-year period 1905–1918 showed that the average seed yield per hectare of Barres mangel was 13.2 hkg. (about 2,900 lbs.) for the warm seasons, 19.6 hkg. for the medium warm seasons, and 12.7 hkg. for the cool seasons. Seasons with an average summer temperature of 15° C. (59° F.) were regarded as warm, 14.1 as medium warm, and 13 as cool. The distribution of the three types of seasons over a period of 25 years is pointed out, and the conclusion is reached that Denmark is climatically well situated for the production of high grade sugar beet seed.

Root crops, T. S. Parsons (*Wyoming Sta. Circ. 14 (1919), pp. 4*).—Observations on growing mangels, rutabagas, sugar beets, and turnips in Wyoming at an elevation of about 7,100 ft. are briefly noted, including yield data. It is stated that the best results were secured with rutabagas and turnips.

Growing alfalfa in Maryland, N. Schmitz (*Maryland Sta. Bul. 228 (1919), pp. 3–30, figs. 7*).—Based on the results secured from 610 systematically planned field tests made during the past 11 years and on data collected from 988 additional alfalfa fields, the author outlines cultural methods and field practices deemed best for growing the crop in the State.

It is stated that on soils other than those derived from oyster shells or limestone alfalfa will not produce profitable returns for more than three years, while on limestone soils the productive period of most of the fields examined extended over 4 or 5 years. Of 21 fields which lasted 10 years or more, 8 produced good yields for 15 years. A soil capable of producing at least from 40 to 50 bu. of corn per acre in a normal season is regarded as essential for successful alfalfa production.

In observations made on 1,012 fields representing the important soil types to determine the extent of natural inoculation, 68 showed successful inoculation, 840 partial inoculation, and 104 no inoculation. Only 11.4 per cent of the fields were classed as successful without artificial inoculation.

Fall seeding is deemed preferable to spring seeding in most cases.

Experiments in spacing cotton, O. F. Cook (*Jour. Amer. Soc. Agron., 11* (*1919*), *No. 7, pp. 299–303*).—In this paper, a contribution from the Bureau of Plant Industry, U. S. Department of Agriculture, the author discusses the advantages of single-stalk cotton culture, and outlines briefly means for gaining familiarity with the system under local conditions in the cotton belt. See also a previous note by Cardon (E. S. R., 39, p. 534).

Meadow fescue, H. N. Vinall (*U. S. Dept. Agr. Dept. Circ. 9* (*1919*), *pp. 4, fig. 1*).—This contains a brief account of the adaptations, cultivation, and utilization of *Festuca pratensis*.

"Shelled" grain in oats, R. G. Stapledon and H. Loveday (*Jour. Bd. Agr.* [*London*], *26* (*1919*), *No. 5, pp. 489–494*).—The authors describe observations made at the British Seed Testing Station on the germination of shelled grain occurring in oat samples as compared with that of normal unshelled grain. It is stated that the amount of shelled grain did not usually exceed from 3 to 5 per cent by weight of the sample, and that it occurred most frequently and in greatest amount in the Supreme variety.

On the average, shelled grain germinated about 24 per cent below the normal unshelled grain. It was found that this relatively poor germination was not due to the influence of drying on the unprotected grain, but rather to mechanical injury during the thrashing operations. The amount of injury varied greatly, in some few cases the shelled grain germinating practically as well as the unshelled, while in extreme cases it germinated 60 per cent less. The degree of injury also varied in respect to individual grains taken from the same sample, the damage being sufficient to prevent germination or only sufficient to damage the radicle end of the embryo and thus cause abnormal or "plumuler" germination. It is deemed probable that the amount of shelling that takes place and the extent of damage done to the shelled grain depends both upon the condition of the grain thrashed and the "setting" of the machine.

Percentage of husk in different [oat] varieties, R. G. Stapledon and H. Loveday (*Jour. Bd. Agr.* [*London*], *26* (*1919*), *No. 5, pp. 494–496*).—In connection with the work described above a large amount of grain was hand-shelled, making it possible to determine the weight of 1,000 grains and the percentage of husk in 26 varieties of oats from the 1917 harvest. The weight of 1,000 grains ranged from 24.54 gm. for Sandy to 51.18 gm. for Storm King, and the percentage of husk from 22.54 for Longhoughton to 30.48 for Storm King. Swedish Crown, White Crown, Wide-awake, Yielder, and Prolific possessed a relatively heavy grain weight with a small proportion of husk, while Storm King, Tartar King, Black Mogul, and Leader although having heavy grain also had a high percentage of husk.

Electroculture experiments by the South Wales Power Co., C. T. Allan (*Electrician* [*London*], *83* (*1919*), *No. 3, pp. 98, 99, fig. 1*).—Two years' experiments on potatoes in a heavy loam soil, using a network of No. 24 steel wire with meshes 6 ft. square and straight wires 9 ft. apart, suspended 5 ft. and 2 ft. above the plat, are reported. A current varying between 30,000 and 39,000 volts was used. Treatment was usually given between the hours of 6 and 9 in the morning and 7 and 10 in the evening. During the first year a total of 282 hours' treatment was given and during the second year 588 hours.

An increase in yield of 17.2 per cent was obtained the first year and 12.6 per cent the second year. It was noted that in both years the potato stalks kept green much longer under the network than in the control plats.

Effect of wounds on loss of weight of potatoes, O. BUTLER (*Jour. Amer. Soc. Agron., 11 (1919), No. 7, pp. 304, 305*).—Undamaged potatoes stored at from 8 to 10° C. (from 46 to 50° F.) for 111 days at the New Hampshire Experiment Station showed a loss in weight of from 6.23 to 9.21 per cent, as compared with a loss of from 9.08 to 11.81 per cent sustained by tubers which had been slightly injured. The ratio between the loss of weight of the injured and uninjured tubers did not assume a constant value until after 79 days. Storing mutilated tubers at 20° C. effected a rapid healing of the wound with a consequent slight reduction in the loss of weight, the latter amounting to 11.25 per cent for wounded potatoes stored at 20° for 32 days and then stored for 79 days at from 8 to 10°.

Some new varieties of wheat, J. T. PRIDHAM (*Agr. Gaz. N. S. Wales, 30 (1919), No. 9, pp. 641, 642, pls. 2*).—Brief descriptions are given of three promising strains of wheat designated as Clarendon, Hard Federation, and Warden.

Agricultural seed inspected in the fall of 1918, C. P. SMITH (*Maryland Sta. Bul. 229 (1919), pp. 3–46*).—This bulletin reports the results of purity and germination tests with 537 official samples of agricultural seed collected during September and October, 1918, showing the values given on the tags and those found by examination.

Review of weed laws in [different] countries, H. JUHLIN-DANNFELT (*K. Landtbr. Akad. Handl. och Tidskr., 58 (1919), No. 3, pp. 166–174*).—The weed laws of Denmark, Norway, Germany, Austria, Belgium, United States, Canada, and Australia are given in abstract form. The article is preceded by a discussion of the attention given in Sweden to the question of weed control, with brief references as to how the matter is handled in other countries.

HORTICULTURE.

The carbon nutrition of cultivated plants, H. FISCHER (*Gartenflora, 68 (1919), No. 13–14, pp. 165–168*).—The author describes some field and greenhouse experiments conducted in 1917 and 1918, in which carbon dioxid emanating from some nearby smelting furnaces was purified and conveyed to the greenhouses and field plats in pipes having a system of ventilators. Increased yields and more vigorous growth was secured with plants such as potatoes, beets, tomatoes, bush beans, etc., by the gas treatment, thus confirming earlier investigations of the author (E. S. R., 31, p. 140) and others as to the beneficial effect to plant life of quantities of carbon dioxid greater than that supplied by the air.

To make the use of carbon dioxid of practical value, it is pointed out, many problems relating to the details of treatment should be solved. Several of these problems are here briefly stated. They deal with the interrelation of the carbon dioxid with light, temperature, and moisture conditions, time and duration of treatment, specific effect on different plants, relation to other fertilizers, effect on the composition of plants, effect of treatment on disease and insect attack, etc.

Inspection and analyses of insecticides and fungicides, J. A. SMITH ET AL. (*Ohio Dept. Agr., Bur. Feeds and Fert. Rpt. 1917, pp. 29*).—A report on samples of insecticides and fungicides analyzed by the bureau of feeds and fertilizers of the Ohio Department of Agriculture in 1917.

Report of the Horticultural Experiment Station, 1918 (*Rpt. Hort. Expt. Sta., Vineland, Ont., 1918, pp. 40, figs. 13*).—This includes progress reports on the breeding of orchard and small fruits and vegetables, other experimental work with fruits and vegetables, and experiments with fruit and vegetable by-products.

Summing up the results of the breeding investigations as a whole, a number of hybrid trees and plants have been secured and are being grown for further testing and selection. A summary is given of the blooming dates and time of maturity of different kinds and varieties of fruits in the Niagara Peninsula, based on observations extending over periods of from two to six years. In self-sterility tests of pears, of 11 varieties bagged only one, the Duchess, set fruit from its own pollen. Duchess was only partly self-fertile and showed much heavier fruit when exposed to cross-pollination.

The yields of 11 different varieties of asparagus for the season 1917-18 are given. In an irrigation test with asparagus the average annual gain for irrigation over nonirrigation for the 4 years, 1915-1918, inclusive, was 500.4 lbs. per acre. The results of an irrigation experiment with beets in 1918 were less favorable. A loss resulted in an early irrigated plat, and only a slight gain was secured by irrigating a late plat. Applications of nitrate of soda have substantially increased the yield of beets, but the fertilizer when used with irrigation gave only slightly better results than when used alone. In a comparative test of potato seed tubers from northern *v.* southern Ontario grown tubers the northern grown tubers have given an average annual yield per acre for three years of 197 bu. per acre, as compared with 134 bu. per acre for the southern grown tubers.

Possible correlations concerning position of seeds in the pod, B. D. Halsted (*Bot. Gaz., 67 (1919), No. 3, pp. 243-250*).—In continuation of a similar study of soy beans (E. S. R., 41, p. 42), the author conducted a study with the Henderson Lima bean to determine the possible relationship existing between the position of the seed in the pod and its weight, size, and value for cropping. The results are presented in a series of tables and summarized.

The greatest viability in the variety tested was associated with seeds borne in the middle of the pod. Three-seeded pods constituted over four-fifths of the crop, these and 4-seeded pods being more numerous in the second of the two field harvests of ripe pods. Seeds from the middle of the pods produced a much larger number of pods than did seeds from the base or tip. The heaviest seeds are produced in the 3-seeded pods, and seeds increased in weight from base to tip in all types of pods. Each pod position gave heavier seeds in the second than in the first crop. Seeds associated with aborts excelled those in more normal pods as regards individual weight, this being true for each type of pod and for each pod position. Abortiveness was less in the first harvest, and was least in plants grown from seeds taken from the middle of the pods. Abortiveness was associated chiefly with basal position, decreasing regularly toward the tip of the pod. Pod position giving the greatest seed weight gave also the lowest percentage of abortiveness.

Plants used as spinach (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Dominica, 1917-18, pp. 5, 6*).—The following native and naturalized species are listed as being used for greens in Dominica: Dasheen (*Colocasia antiquorum esculentum*), tania (*Xanthosoma sagittifolium*), calalu (*X. hastifolium*), Indian spinach (*Basella alba*), epinard (*Amarantus viridis, A. tristis*, and *A. spinosus*), herbe amere (*Solanum nodiflorum*), herbe couresse (*Peperomia pellucida*), oreille mulâtre (*Phytolacca rivinoides*), and pourpier (*Portulaca oleracea*).

Kinds and varieties of fruit for planting in the home fruit garden in eastern Montana, A. L. Strausz (*Bien. Rpt. Mont. Bd. Hort., 10 (1917-18), pp. 55-59)*.—A list of orchard and small fruits recommended for planting in the home garden.

Pruning young deciduous fruit trees, W. P. Tufts (*California Sta. Bul. 313 (1919), pp. 113-153, figs. 24*).—A discussion of methods of pruning and shaping young fruit trees, with special reference to California conditions.

Long-continued pruning experiments with almonds, apples, apricots, cherries, peaches, pears, plums, prunes, and walnuts are being conducted by the station and the results thus far secured are embodied in this discussion, and practical suggestions based on the available information are given for the shaping of young fruit trees. A list of cited literature is included.

The author took weights and measurements of the top and root systems of several hundred black walnut, almond, and peach seedlings that had received the same cultural treatment and were allowed to make two seasons' undisturbed growth in the nursery row. These data disclosed the fact that there is a close correlation between the circumference and weight of the tree, both top and root, thus indicating that for young trees making only vegetative growth reliance may be placed on the results obtained from any orchard treatment influencing the growth when such results are based on trunk circumference measurements. It is pointed out, however, that circumference measurements take into consideration only quantitative growth and lose much of their value as soon as the trees begin to produce blossoms and fruit.

Experiments in light, moderate, and heavy pruning of young trees have been conducted during the past four years. Measurements taken at the beginning and at the end of the third season indicated, in general, that the lighter the pruning the greater the tree circumference and consequently the greater the root development. Summer pruning whether performed early or late in the season proved to be devitalizing as measured by trunk increments. Light summer pruning is more weakening than that done during the early part of the season. Two comparatively early summer prunings were only a little more weakening than one given late in the growing period. In spite of the reduction in vigor results from practical applications of an early summer pruning seemed to frequently justify the practice, providing the trees are in a thrifty growing condition and that the work is done as early as possible in the growing season. Lightly pruned trees come into bearing from one to three years earlier than similar trees that have been heavily pruned.

"Thinning-out" entire unnecessary branches is conducive to early fruit-spur development on the remaining branches, whereas "heading-back" all of the branches promotes vegetative growth and retards fruit-spur development. Early bearing is not inimical to future productivity. "Heading-back" should be employed chiefly when "thinning-out" does not produce the desired spread and number of branches for the ultimate framework. Generally speaking, young almonds, apricots, peaches, and Japanese plums require a minimum amount of "heading-back." Sweet cherries and certain varieties of apples, pears, European plums, and prunes require more "heading-back" to control growth.

Factors affecting hardiness in fruits, U. P. HEDRICK (*Mass. State Dept. Agr. Circ. 6 (1919), pp. 10*).—In the spring of 1905 the author addressed letters to about 100 of the best peach growers in Michigan, asking for their experience as to the hardiness of the peach in tree and bud. In the spring of 1907 about the same number of letters were addressed to peach growers in New York. This paper is a brief review of the answers obtained.

Summing up the results of these inquiries, it is concluded that certain varieties are inherently hardier than others. Hardiness is in a great measure dependent upon maturity of the plant, not only of the whole tree, but of parts of the tree, those parts with the poorest sap flow being least hardy. Soils may be either too wet or too dry for the hardiest condition possible. It appears that cover crops and snow are the best protection against winterkilling of the roots. Overbearing in the season preceding a cold winter weakens trees so that they are susceptible to cold, as do also the attacks of insects and fungi.

The notion that trees are hardier under neglect than under high culture seems false, the more vigorous the tree, provided it matures its wood, the hardier.

Origin of a new and improved French prune variety, A. D. Shamel (*Jour. Heredity, 10* (*1919*), *No. 8, pp. 339–343, pl. 1, figs. 3*).—The author describes the work of L. Coates in isolating, propagating, and testing in an experimental orchard a strain of the variety petite prune d'Agen. This originated from a bud variation, and gives promise as a large fruited variety possessing all of the desirable characteristics of its smaller fruited parent.

Observations on the inflorescence of the olive, R. Pirotta (*Atti R. Accad. Lincei., 5 ser., Rend. Cl. Sci. Fis., Mat. e Nat., 28* (*1919*), *II, No. 1–2, pp. 3–9*).—Repeated observations have led the author to conclude that the common olive (*Olea europæa*) is a polymorphic species in regard to the constitution of its inflorescence. The olive has three types of flowers: Strictly hermaphroditic flowers, producing fruit and seed; strictly staminiferous flowers; and physiologically staminiferous flowers, which have normal stamens but an abnormal pistil. These various types of flowers sometimes occur on separate trees, at other times two types appear on the same tree. The occurrence of hermaphroditic and staminiferous flowers on the same tree is not very frequent, but the occurrence of hermaphroditic flowers and the so-called physiologically staminate flowers on the same tree is of frequent occurrence.

As a result of numerous examinations the author concludes that the fertility and sterility of olive trees depends directly on the prevailing type of inflorescence.

Statistics on the production of grapes and wine in 1918 (*Estadís. Prod. Vitic.* [*Spain*], *1918, pp. 7*).—In continuation of a previous report (E. S. R., 39, p. 845), a statistical report on the production of grapes and wines in various regions and Provinces of Spain during the year 1918 is given.

Observations and opinions on avocado culture, W. A. Spinks (*Cal. Citrogr., 5* (*1919*), *No. 2, pp. 36, 58, fig. 1*).—Observations on the propagation and culture of avocados, based largely on the author's experience.

Influence of character of stock on tree growth in citrus propagation, H. J. Webber (*Cal. Citrogr., 5* (*1919*), *No. 2, p. 35*).—A contribution from the California Experiment Station, summarizing studies in stock selection for citrus fruits.

Tests were made at the Citrus substation of large, intermediate, and small-sized nursery trees upon which were budded navel and Valencia oranges and the Marsh seedless grapefruit. At the time the buds were 4.5 years old and the trees had been planted 2.5 years in the orchard the differences in size of the stocks were of the same nature as when the trees were dug from the nursery. The large trees remained large and the small trees remained small. A study of the reasons for this condition indicates that it is caused by the different character of the seedlings on which the trees are budded. Many widely different types of seedlings were observed, and it was found that some are much more vigorous growers than others. It is pointed out that promiscuous budding on stocks of such variable type is responsible for much of the variability in size and production of trees in California groves.

Automatic disbudding of citrus, J. E. Coit (*Cal. Citrogr., 5* (*1919*), *No. 2, p. 37, fig. 1*).—The author briefly describes and illustrates the phenomena of abscission among the growing tips of orange twigs, and calls attention to the possibility of abscission being mistaken for the citrus blast disease in the case of very vigorous growing shoots.

[Notes on the culture of limes] (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Dominica, 1917–18, pp. 17–26*).—Notes on various phases of lime growing based on work conducted at the Dominica Experiment Station. The following phases are discussed: Protection from wind, draining, manuring, mulching, cover cropping and green manuring, budding, layering, yield of lime trees, pruning, propping the branches, and use of dynamite in lime cultivation.

A basis for tea selection, C. P. COHEN STUART (*Bul. Jard. Bot. Buitenzorg, 3. ser., 1 (1919), No. 4, pp. 193–320, pls. 11*).—A translation in rearranged and revised form of the first two chapters of the author's earlier dissertation on tea selection (E. S. R., 36, p. 241), which chapters deal with the history, geographic distribution, and botany of the tea plant. Subsequent translations will deal with the research and demonstration features of the dissertation.

A bud variation of the Le Grand Manitou dahlia, A. D. SHAMEL (*Jour. Heredity, 10 (1919), No. 8, pp. 367, 368, fig. 1*).—A case of bud variation in the well-known dahlia variety Le Grand Manitou is described and illustrated.

Mutation in Matthiola, H. B. FROST (*Univ. Cal. Pubs. Agr. Sci., 2 (1919), No. 4, pp. 81–190, pls. 14, figs. 4*).—A contribution from the California citrus substation describing the occurrence, characteristics, and heredity of certain aberrant plant types which decidedly resemble some of the "mutant" types poduced by *Œnothera lamarckiana* The parent form upon which the study was based is *Matthiola annua* Sweet, of the horticultural variety Snowflake. A bibliography of cited literature is appended.

At least 8 types have been somewhat carefully studied, and 6 of these have shown their heritability in progeny tests. Most of the mutant types are, in general, inferior to Snowflake in vigor, and the difference in development is greatly increased by certain unfavorable environment conditions. The mutant types differ from Snowflake and from each other in various respects; one, an early type, is practically a smaller and earlier Snowflake. The others differ markedly from Snowflake in vigor, fertility, and various form and size characters.

A remarkable bud sport of Pandanus, J. H. SCHAFFNER (*Jour. Heredity, 10 (1919), No. 8, pp. 376–378, fig. 1*).—A contribution from the department of botany, Ohio State University, describing and illustrating a bud sport of the screw pine (*Pandanus utilis*).

FORESTRY.

The reconstitution and exploitation of forests after the war, J. DEMORLAINE (*Bul. Soc. Encour. Indus. Natl.* [*Paris*], *118 (1919), II, No. 5, pp. 155–176, figs. 13*).—A paper read before the French Society for the Encouragement of National Industries, in which the author reviews the forest situation in France before the war, presents statistics on the production and consumption of timber in the principal countries of the world, describes forest exploitation in France during the war, and advocates the organization of forest services in the French colonies in order to prevent waste and abuse in the exploitation of the forests.

Arbor Day, L. C. EVERARD (*U. S. Dept. Agr., Dept. Circ. 8 (1919), pp. 23, figs. 2*).—A discussion of the origin of Arbor Day, its relation to civic betterment, and the planting of trees as living monuments to our fallen soldiers. The dates on which Arbor Day is observed, together with lists of trees suitable for planting in various portions of the United States, are given.

Vacation land.—The National Forests in Oregon (*U. S. Dept. Agr., Dept. Circ. 4 (1919), pp. 72, pl. 1, figs. 24*).—An account of the recreational features of the National Forests in Oregon, including much information of value to tourists and campers.

Out-of-door playgrounds of the San Isabel National Forest (*U. S. Dept. Agr., Dept. Circ. 5 (1919), pp. 19, pl. 1, figs. 7*).—An account similar to the above of the recreational attractions of the San Isabel National Forest in southern Colorado.

A summer vacation in the Sopris National Forest (*U. S. Dept. Agr., Dept. Circ. 6* (*1919*), *pp. 15, pl. 1, figs. 5*).—An account similar to the above of the recreational attractions of the Sopris National Forest in Colorado.

Report of the State firewarden, C. P. Wilber (*Ann. Rpt. Dept. Conserv. and Develop., N. J., 1918, pp. 73–102, pls. 2*).—A report of forest fire protective work in New Jersey for the season of 1917–18, including data on forest fires in previous years.

Oregon forest fires laws, 1911–1919 (*Salem, Oreg.: State Bd. Frestry, 1919, pp. 18*).—A booklet containing the forest fire laws enacted by the Oregon Legislative Assembly during the period 1911–1919, inclusive.

Timber line studies in the northern part of Luleå-Lappmark, J. Frödin (*Lunds Univ. Årsskr., n. ser., Sect. 2, 13* (*1917*), *No. 2, pp. 74, pls. 2, figs. 10*).—The author took level measurements of birch and pine forests in the mountainous regions of northern Luleå-Lappmark during the summer seasons of 1910–1915, inclusive. A considerable variation was observed in the limit of forest growth in different parts of the region studied, and is here discussed. Consideration is given to the factors of temperature, wind, air moisture, and soil moisture as influencing forest distribution.

Timber production and growth curves in the mountain ash (Eucalyptus regnans), R. T. Patton (*Proc. Roy. Soc. Victoria, n. ser., 30* (*1917*), *No. 1, pp. 1–3, pls. 2*).—The author presents results of a series of log measurements of mountain ash carried out at Powellton, Victoria, together with several graphs illustrating the growth of mountain ash up to the age of 80 years.

The history of the Dukeld hybrid larch (Larix eurolepis), with notes on other hybrid conifers, A. Henry and M. G. Flood (*Proc. Roy. Irish Acad., 35* (*1919, Sect. B, No. 4, pp. 55–66, pl. 1*).—The Dunkeld hybrid larch is the name given by foresters to seedlings that have been repeatedly raised from the seed of certain Japanese larch trees (*L. leptolepis*), growing near Dunkeld, Perthshire. The authors conclude that the hybrids have resulted from the cross-pollination of *L. leptolepis* and nearby *L. europœa* trees. The hybrids are therefore given the name *L. europlepis*. Both the parent forms and the hybrids are described with reference to their visible and microscopic characters, and notes are given on other hybrid larches and conifers.

Note on Hopea canarensis, R. S. Hole (*Indian Forest Rec., 7* (*1919*), *No. 3, pp. 4, pl. 1*).—The new species here described in detail is confined, so far as known, to the Western Ghats hill forests along the South Canara-Mysore boundary.

Note on Ixora butterwickii, R. S. Hole (*Indian Forest Rec., 7* (*1919*), *No. 4, pp. 4, pl. 1*).—A botanical description of this new species, which occurs in the forests of Burma.

Yemané (Gmelina arborea) in upper Burma, C. G. E. Dawkins (*Indian Forester, 45* (*1919*), *No. 10, pp. 505–519, pls. 2*).—Notes on the results of some regenération experiments with this timber species being conducted in Katha are given.

Philippine mangrove swamps, W. H. Brown and A. F. Fischer ([*Philippine*] *Bur. Forestry Bul. 17* (*1918*), *pp. 132, pl. 1, figs. 59*).—This bulletin contains a key and descriptions of the species growing in the Philippines mangrove swamps, considerable statistical data showing the stands of timber and firewood in a number of these swamps, and an account of the swamp cultivation of bakauan (*Rhizophora* spp.) for firewood in the swamp region adjoining the upper part of Manila Bay. Information is also given relative to the importance of various species in the mangrove swamps as sources of fuel and tanbark, together with notes on the economic uses of the nipa palm.

A rubber plant survey of western North America, H. M. HALL and T. H. GOODSPEED (*Univ. Cal. Pubs. Bot., 7 (1919), No. 6–8, pp. 159–278, pls. 3, figs. 8*).—Under this general heading are presented the following three papers dealing with different phases of an investigation of the rubber-yielding possibilities of certain native West American shrubs:

I. *Chrysothamnus nauseosus and its varieties*, by H. M. Hall (pp. 159–181).—A preliminary paper containing a key to and synopsis of the varieties of *C. nauseosus*, which species gave more promise as a rubber producer than any other species of the genus.

II. *Chrysil, a new rubber from C. nauseosus*, by H. M. Hall and T. H. Goodspeed (pp. 183–264).—The investigation here reported on was instituted for the purpose of locating a supply of rubber which it was thought might exist in certain native West American shrubs.

Rubber was found in two closely related genera, namely, Chrysothamnus and Haplopappus. The most important of Chrysothamnus is *C. nauseosus*. Twelve varieties of *C. nauseosus* have been examined and rubber found in all of them, although individual plants may be devoid of rubber. This rubber, which is of high grade and vulcanizes without difficulty, has been named Chrysil.

Chrysil occurs in the individual cells and is not a latex rubber. Methods have been developed for its detection by microscopical examination as well as by chemical analysis. The results of 180 microscopical examinations are tabulated. The highest absolute percentage was found in a plant of the variety *consimilis*, which analyzed 6.57 per cent of pure rubber, although the average for this variety was only 1.97 per cent. One plant of the variety *viridulus* yielded 5.56 per cent of pure rubber, the average for this variety being 2.52 per cent. The highest rubber content for any variety was 2.83 for *hololeucus* The best yielding varieties are those which inhabit alkaline soils.

Chrysil occurs in the plant in greatest amount at about the soil line. It is present only in the upper part of the root, and occurs in only small amounts in young twigs and leaves. The richest rubber tissues are first the cortex and then the medullary rays.

C. nauseosus is a large shrub, averagingg 4 to 6 lbs. in weight. It grows readily from seed and reaches maturity in from 6 to 8 years. It is widely distributed in western North America, the largest stands being in Colorado, Nevada, and Utah. Plants from Nevada and California have given the highest rubber content. In harvesting wild shrub the whole plant should be taken, including 4 in. of root.

Because of the desirability of establishing the rubber-growing industry in the United States on waste lands, the authors recommend further investigations looking to the commercial cultivation of Chrysothamnus and other plants. A preliminary study of the cultural possibilities of these plants indicates that they could be grown on many of the alkaline plains of the West without irrigation. Certain varieties endure winter temperatures of —20° F., others would withstand summer temperatures obtaining anywhere in the Western States, excepting possibly in the hottest valleys.

III. *The occurrence of rubber in certain West American shrubs*, by H. M. Hall and T. H. Goodspeed (pp. 265–278).—In the above paper attention was given almost exclusively to rubber as it occurs in the numerous varieties of *C. nauseosus*. The present paper gives the results of investigations with related species and genera, as well as with some species of shrubs not closely related to Chrysothamnus.

Rubber was found in four other species of Chrysothamnus and in 10 species of Haplopappus, but the authors were unable to detect rubber in any plant other than those showing a close botanical affinity to Chrysothamnus. A list is given of species examined in which no rubber could be detected with certainty. Analytical data are given for those species in which rubber was detected. The regional distribution of rubber in *H. ericoides* was the reverse to that found indicated for Chrysil in the above noted paper. The parts above the soil line are strikingly deficient in rubber as compared with the roots. The percentage is found highest in the extremities of the roots, and decreases upward toward the soil line. In *H. nanus* the stem and root appeared to bear equal quantities of rubber.

[Rubber in Gold Coast], W. S. D. TUDHOPE ET AL. (*Govt. Gold Coast, Rpt. Agr. Dept., 1918, pp. 15, 16, 17, 28, 30, 31, 33–38, 39, 40, 41, 42, 43, 46, 48, 49, 55, 58, 60, 62, 63*).—Notes on the present status of the rubber industry in Gold Coast, including data on cultural and tapping experiments at the various agricultural stations and substations.

The Hevea rubber-tapping experiments have shown fairly conclusively that cuts to the left of the central channel give better yields than similar cuts to the right. When operating on one-third of the stem, the best yields may be expected with a maximum of three lateral cuts. Daily tapping during alternate months appears to give better results than alternate-day tapping.

Investigations concerning the origin of latex vessels and latex in Hevea brasiliensis, W. BOBILIOFF (*Arch. Rubbercult. Nederland. Indië, 3 (1919), No. 2, pp. 43–67, figs. 14*).—The author presents results of studies of the primary latex formation in Hevea from the youngest stage of the seedling to that found in a mature tree. Particulars concerning the development of latex vessels are also discussed.

Does the tapping with driptins give any advantage? P. ARENS (*Arch. Rubbercult. Nederland. Indië, 3 (1919), No. 2, pp. 36–42*).—Driptins were used in tapping rubber on one of the estates near the Malang experimental station. The author collected data from this operation to determine whether, as it is commonly claimed, the addition of water to the latex by using driptins will increase the total quantity of rubber and decrease the quantity of scrap rubber. The data obtained showed no advantage from the use of driptins, and in some cases there appeared to be a financial loss.

Pulpwood consumption and wood pulp production in 1918, F. H. SMITH (*U. S. Dept. Agr., Forest Serv., 1918, pp. 20*).—Detailed statistics on pulpwood consumption and wood pulp production in the United States during 1918, with comparable data for 1916 and 1917. The data were collected and compiled by the Forest Service of this Department in cooperation with the News Print Service Bureau.

The consumption of pulpwood by 250 establishments in 1918 was 5,250,794 cords, or a decrease of 4 per cent from the consumption in 1917. Wood pulp production aggregated 3,313,861 tons, a decrease of 6 per cent from 1917.

DISEASES OF PLANTS.

The application of genetics to the control of plant disease (*Bd. Agr. India, Proc. Meeting Mycol. Workers, India, 2 (1919), pp. 62–65*).—This is a review of progress in the application of genetics to the control of plant disease in view of conditions existing in India.

Presence of nitrites and ammonia in diseased plants.—II, Oxidases and diastases; their relation to the disturbance, P. A. and M. BONCQUET (*Jour. Amer. Chem. Soc., 39 (1917), No. 9, pp. 2088–2093; abs. in Jour. Chem. Soc. [London], 111 (1917), No. 661, I, p. 683*).—Having noted in a previous paper (E. S. R., 37, p. 549) that in certain plant diseases of the so-called physiological type, such as curly top of sugar beet, nitrates and ammonia were detected in the extracted juices, regarding the origin and behavior of which certain suppositions are stated, the authors here report subsequent observation and experimentation dealing with the same disease. These corroborate the view of nitrogen starvation of the plant by bacterial reduction of the nitrates taken up by the roots to nitrites and ammonia.

It is stated that the biological, physiological, and mycological phenomena in some plants infected with nitrate-reducing organisms seem to work in harmony for the preservation and increase of the nitrogen content of the plant tissues. The oxidizing enzyms, which tend to neutralize the reducing action of the bacteria, work in the direction of preservation. The morphological changes (as reduction in size of certain organs) that occur after infection seem to economize the nitrogen and preserve it for the more essential parts of the plant, as roots and leaves. Increased tendency to supply the plant with nitrates is evidenced by the fact that the root system increases and the plant uses more water per unit of dry weight. In spite of this fact the decrease in total nitrogen suggests that the bacteria, in reducing nitrates to nitrites and ammonia, waste this necessary element, thus bringing about nitrogen starvation.

Report of the mycologist, R. E. BUNTING (*Govt. Gold Coast, Rpt. Agr. Dept., 1916, pp. 20–22*).—Cacao brown rot, which was increasingly prevalent during the year, was not correlated with climatic conditions. The question as to a causative relation between *Diplodia cacaoicola* and this trouble was not settled. Experiments regarding the effect on yield of spraying with Bordeaux mixture were not conclusive. White thread disease of cacao was reported as widespread and increasing. Clean cultivation appears to be practically preventive. Humidity is an unfavorable condition. Root diseases (*Hymenochæte noxia* and *Polyporus lignosus*) do not appear to have increased or decreased greatly. *H. noxia* is the more destructive of these. *Rosellinia* sp. caused a few deaths in Ashanti. *Cephaleuros virescens* is noted as on living or dead cacao twigs. It was confined to the tips and may simply indicate weakness in the infected tree. This fungus has also been found on the Royal palm and the shea butter tree.

Hemileia sp. on coffee may be parasitized by another fungus. *Pestalozzia guepini* var. has been found destroying the foliage of Liberia coffee. Para rubber was attacked by *Sphærostilbe repens* and *P. lignosus*. A canker examined was not determined as to causation, but *D. cacaoicola* was found on one specimen. A fungus closely resembling *Eutypa erumpens* found on Para rubber plants at Tarquah may prove to be saprophytic. *Phytophthora* sp. was found on fruits of Para rubber at Aburi. Young plants of *Cola acuminata* were found to be affected with *Pleurotus colæ*. An outbreak of disease of peanut at the Peki Station has been reported.

The outstanding feature of the year was the increasing prevalence of the white thread and of the brown pod disease on native cacao farms.

Mycology and plant pathology, J. MACKENNA (*Rpt. Prog. Agr. India, 1917–18, pp. 78–85*).—A review of work done on diseases affecting various crops includes ufra (*Tylenchus angustus*) and blast (*Piricularia oryzæ*) of rice; black band disease (*Diplodia corchori*, *Rhizoctonia?* sp); bud rot of palmyra, koleroga of areca, and bleeding disease of coconut palm; root disease, die back, brown blight, and rim blight of tea; leaf disease and black rot of coffee; black thread and leaf-fall (*Phytophthora meadii*) of Hevea; die back and blossom and twig rot (*Choanephora cucurbitarum*) of chilies; tikka disease (*Cercospora personata*) of peanut and a peanut disease caused by an undetermined species of *Cercospora*; smut of Guinea corn (prevented by seed treatment with copper sulphate); leaf curl of peaches (greatly affected by spraying); a sclerotial fungus attacking the Rangoon bean; opium poppy mildew (*Erysiphe polygoni*); wilt disease of *Cajanus indicus;* and sal tree root rot.

Provincial disease survey.—An account of the work in hand in the different Provinces; suggestions for extending mycological work in the Provinces and for popularizing the knowledge of plant diseases amongst cultivators (*Bd. Agr. India, Proc. Meeting Mycol. Workers, India, 2 (1919), pp. 12–29*).—An account is given of the work in hand in different Provinces, also of suggestions for extending the work and benefits of mycological study. Reports and discussion are detailed, dealing with potatoes, cereals, sugar cane, legumes, peanuts, pepper, tobacco, jute, palm, cotton fruits, and fiber crops.

Diseases of planters' crops (*Bd. Agr. India, Proc. Meeting Mycol. Workers, India, 2 (1919), pp. 52–58*).—This includes verbal reports on various diseases of plants in regions of India.

[Combating plant diseases in India] (*Bd. Agr. India, Proc. Meeting Mycol. Workers, India, 2 (1919), pp. 40–52*).—This includes reports, with discussion, on dusting and spraying for various plant diseases in portions of India. The diseases dealt with include grape downy mildew, areca nut koleroga, and coffee leaf disease.

Burgundy mixtures and other copper sprays, G. T. Spinks (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1918, pp. 19–24; also in Jour. Bath and West and South. Counties Soc., 5. ser., 13 (1918–19), pp. 134–139*).—From tests as detailed with discussion, it is concluded that a 1 per cent Burgundy mixture having 4 lbs. copper sulphate and 7.2 lbs. sodium carbonate in each 40 gal. water (designated as a 4:7.2 preparation) will keep for the longest time in fit condition for spraying, while the 4:5 mixture crystallizes most rapidly. This and the 4:4.25 mixture form equally good coverings, but in this respect the 4:7.2 mixture is slightly inferior. All the mixtures adhere and resist rain equally well, and all are equal as regards scorching the foliage. While laboratory tests indicate equal fungicidal value for all the above, no satisfactory field tests have yet been made.

Copper stearate is also discussed, as is the preparation of Burgundy mixture from a ready-made basis.

Disinfection of seeds with bromin, V. Abtsixovsky and J. Stom (In *Hibridicultura y Otros Trabajos de las Estaciones, 1917. Madrid: Estac. de Ensayo de Semillas, 1917, pp. 51–64, pl. 1, figs. 4*).—From results here tabulated with discussion, it appears that bromin in aqueous solution at a concentration of 1 per cent applied to seeds of various common plants for periods ranging from ½ hour to 4 hours gave high to perfect percentages of protection against seed-borne diseases. Vitality was impaired but little, if any, in most cases by even the longest of these periods of exposure, though longer periods, which were also employed, generally lowered or destroyed germinability.

Seed disinfection for pure culture work: The use of hypochlorites, B. M. Duggar and A. W. Davis (*Ann. Missouri Bot. Gard., 6 (1919), No. 2, pp. 159–170*).—Without going beyond the readily obtainable commercial products, which have been compared with a few standard disinfectants of other groups, the authors have carried out studies, the results of which are tabulated.

As a practical result of the experiment on seed treatments, they believe that, taking into consideration both the capacity of seed for germination and relative freedom from contamination, the commercial chlorinated potassa or Javel water is the most satisfactory agent which has yet been considered. The length of time required for practically perfect disinfection of certain seed in these experiments was three hours or longer. In some cases interrupted disinfection fully warrants the extra trouble and delay. The value of soaking the seed previous to the longer interval treatments is doubtful, though a preliminary thorough washing of all seed, with removal of decayed and imperfect ones, is advisable. A study of standardized hypochlorites is considered as essential.

Seed disinfection for pure culture work, H. C. YOUNG (*Ann. Missouri Bot. Gard., 6 (1919), No. 2, pp. 147–158*).—This work employed chlorid of lime (largely calcium hypochlorite), formaldehyde, alcohol, and mercuric chlorid, these being applied to seeds of various common plants according to methods described. From the results obtained as tabulated, the conclusion is reached that it appears necessary to continue to treat the various seeds with different disinfectants and according to different methods on account of differences in the contaminating organisms.

The Thelephoraceæ of North America, VIII–X, E. A. BURT (*Ann. Missouri Bot. Gard., 4 (1917), No. 3, pp. 237–269, figs. 19; 5 (1918), Nos. 3, pp. 177–203, figs. 14; 4, pp. 301–370, pls. 2, figs. 32*).—Of these three chapters, which do not conclude the series, the first deals with Coniophora, the second with Aleurodiscus, and the third with Hymenochæte.

Merulius in North America, supplementary notes, E. A. BURT (*Ann. Missouri Bot. Gard., 6 (1919), No. 2, pp. 143–145*).—This addition records a few species not included in the above notes, with some discussion of other species.

Comparative studies on three Xylarias, H. VON BRONSART (*Centbl. Bakt. [etc.], 2. Abt., 49 (1919), No. 1–4, pp. 51–76, pl. 1, figs. 4*).—This is a study of *Xylaria arbuscula*, *X. hypoxylon*, and *X. polymorpha*.

Basal rots of garden plants, J. MATZ (*Rev. Agr. Puerto Rico, 3 (1919), No. 2, pp. 44–48, figs. 3*).—This includes mainly a discussion of *Sclerotium* sp. and *Rhizoctonia* sp. in relation to diseases, chiefly rots of the lower aerial portions, of common garden plants.

The more important fungus and bacterial diseases of vegetables in Ontario, J. E. HOWITT and D. H. JONES (*Ontario Dept. Agr. Bul. 258 (1918), pp. 48, figs. 53; abs. in Abs. Bact., 2 (1918), No. 4, p. 213*).—The more important vegetables are dealt with in connection with their more common diseases, and remedial treatments are briefly discussed.

The dry root rot of the bean, W. H. BURKHOLDER (*New York Cornell Sta. Mem. 26 (1919), pp. 1003–1033, pls. 2, figs. 3*).—A description is given of the dry root rot of the beans caused by *Fusarium martii phaseoli*, n. form. As the common name indicates, the disease affects principally the underground parts of the plant, but portions above ground also show the effect of the fungus. The symptoms are described at length, and comparisons made with those of the black root rot of beans due to *Thielavia basicola* and of a Rhizoctonia blotch. The morphology, life history, pathogenicity, etc., of the organism are described at length.

The disease is known to have been present for some years, and together with other root diseases it has caused considerable loss. Special attention is called to control measures, which include rotation of crops, soil treatment, and use of resistant varieties. Rotations, unless of quite lengthy duration, do not offer much promise of control. Soil treatments were not beneficial, and probably breeding resistant strains offers the best means of control.

Further studies on treatment of beet seed for control of root scab, K. KRÜGER and G. WIMMER (*Ztschr. Ver. Deut. Zuckerindus., 1917, No. 743, II, pp. 649–654*).—Since their previous report (E. S. R., 33, p. 848), the authors have tested other fungicides for use with beet seed, and their results are detailed and tabulated. The best disinfection was again given by carbolic acid.

Cotton boll disease, R. G. DE SOUSA (*Bol. Agr. [Sao Paulo], 19. ser., No. 5–7 (1918), pp. 477, 478, fig. 1*).—The author notes briefly a disease of cotton bolls which may be identical with that noted by Delacroix (E. S. R., 26, p. 51), and which is attributed to *Bacillus gossypinus*. In association with this organism was found also the fungus *Colletotrichum gossypii*.

[A wilting disease of cotton in Colombia], J. F. Pestico (*Rev. Agr. [Colombia], 4, (1918), No. 2, pp. 113-116, fig. 1*).—An account is given of a disease which is designated as fucha of cotton in the Department of Boyacá, Colombia. The injury is manifested in the leaves and tender shoots or more rarely in the blooms, in the form of intumescences, usually after a period of hot, damp weather in a situation where cultivation is defective and intercropping is unskillfully practiced. The plants wilt and die usually in a few weeks. Fully nourished, well-developed plants do not usually develop the trouble, though in some instances such plants manifest susceptibility to the disease.

Diseases of eggplant, S. C. Bruner (*Estac. Expt. Agron. Cuba Circ. 53, pp. 20, pls. 6*).—In this circular, prepared for Cuban agriculturists, the author presents results from investigations still in progress regarding a number of diseases of eggplant (*Solanum melongena*), in connection with which a discussion is also given of *Phomopsis vexans*, Rhizoctonia, *Colletotrichum glœosporioides*, *Bacterium solanacearum*, and *Heterodera radicicola*, with mention of other parasitic organisms.

A note on the dropping of flowers in the potato, M. J. Dorsey (*Jour. Heredity, 10 (1919), No. 5, pp. 226-228, fig. 1*).—Examination of the parts and processes concerned in the dropping of potato blooms has led to the conclusion that physiological factors may operate independently of pollen or pistil development to cause the premature dropping of the blooms.

Prematuring and wilting of potatoes, G. P. Clinton (*Potato Mag., 1 (1919), No. 12, pp. 12, 13, 24, fig. 1*).—An account is given of an unusual condition suddenly appearing in Connecticut potato fields, particularly in poor soil insufficiently fertilized.

Frost necrosis of potato tubers, L. R. Jones, M. Miller, and E. Bailey (*Wisconsin Sta. Research Bul. 46 (1919), pp. 46, pl. 1, figs. 12*).—The authors have investigated the effect of low temperatures on potato tubers on account of their liability to injury during all stages of harvest, transportation, storage, and delivery. Several forms of possible injury are recognized, and their symptoms contrasted with diseases of tubers the symptoms of which resemble those of frost necrosis.

In summarizing the results of their investigations, the authors state among other things that where tubers are frozen solid they immediately collapse upon thawing and because of their wet appearance are easily detected. In case of mild exposure only a part of the tubers may be frozen and the rest appearing normal are considered satisfactory for storage, market, or seed purposes. However, if these tubers are cut open a certain proportion of them will show evidences of internal frost necrosis.

Three types of injury are recognized, ring necrosis, where there is discoloration of the vascular ring especially evident at the stem end when the tuber is cut crosswise; net necrosis, in which the vascular tissue, including the small thread-like phloem elements scattered throughout the pith and cortex, are darkened; and blotching, in which discolored tissue in patches, usually having vascular elements as centers, is distributed irregularly throughout the tuber. Such internal freezing injuries are not ordinarily visible externally, even after long storage, but in white-skinned varieties they may show as darkened areas on the skin, and in prolonged dry storage frost necrotic tubers wilt faster than normal ones. The necrotic discolorations are said to develop promptly after freezing, passing from pink to dark brown or black and ordinarily undergoing little further change thereafter, even during long storage. Considerable difference was noted between individual tubers in susceptibility to frost injury even in the same lot of potatoes, but in general neither variety, size, maturity, nor relative turgidity of potato tubers influences to any marked degree the liability to injure nor the type of resistant frost necrosis.

In general, frost necrosis is said to appear in at least a portion of tubers which are subjected to a temperature of —10° C. (14° F.) for one hour, to —5° for two hours, or to —3° or slightly lower temperature for several hours. Sprouts have been found more resistant to freezing than the tubers from which they arose. but uninjured sprouts on necrotic tubers often do not outlive the germination period, probably due to extensive vascular injuries of the tuber.

Plants produced by the frost necrotic halves of experimental tubers grew more slowly than those from the control halves, but ultimately produced as large and healthy and as abundant a crop. Nothing was found to indicate the transmission of necrotic symptoms to the progeny of frost necrotic seed potatoes.

Potato diseases, A. PACHANO (*Quinta Norm. Estac. Expt.* [*Ambato, Ecuador*], *Circ. 7* (*1918*), *pp. 11*).—This account deals with potato late blight (*Phytophthora infestans*) and early blight (*Alternaria solani*).

Potato spraying trials, 1917, G. T. SPINKS (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1918, pp. 16–18; also in Jour. Bath and West and South. Counties Soc., 5. ser., 13* (*1918–19*), *pp. 131–133*).—The author gives an account of treatments of potato plats with Bordeaux mixture, Burgundy mixture with various proportions of soda, Burgundy made with special forms of soda, Burgundy with substances added to increase adhesiveness, proprietary mixtures including powders applied dry, and copper stearate, the plats being gone over from one to three times.

Circumstances were such that no definite information could be gained regarding the relative fungicidal efficiency of the applications. The total crop showed an average practically unchanged by treatments, though in one or two varieties named there was a marked resistance to the disease.

The eelworm disease of potato, L. P. BYARS (*Potato Mag., 1* (*1919*), *No. 12, pp. 10, 11, figs. 5*).—This descriptive account of nematode (*Heterodera radicicola*) attack on potato distinguishes between this trouble and attack by the flea beetle (*Epitrix cucumeris*) as regards effects on the tuber and as regards regional relations. The nematode is active in the South and the flea beetle in the North.

The skin spot disease of potato tubers, M. N. OWEN (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 8* (*1919*), *pp. 289–301, pl. 1, figs. 11*).—This disease is described as to external appearance and microscopic and cultural characters. The fungus is thought to be different from that previously classified by Pethybridge (E. S. R., 34, p. 443) as *Spicaria solani*, and is considered as a new species which is technically described as *Oospora pustulans*.

Ormskirk potato trials, 1919 [in the breeding of potatoes resistant to wart disease] (*Gard. Chron., 3. ser., 66* (*1919*), *No. 1704, p. 106*).—Varietal tests for resistance of potatoes to wart disease (*Synchytrium endobioticum*) at Ormskirk are said to have developed several resistant varieties among the second-early kinds, though the results were less definite with the first-early varieties.

Protect seed potatoes against disease, W. A. ORTON (*Potato Mag., 1* (*1919*), *No. 11, pp. 6, 7, figs. 6*).—Suggestions are given regarding seed potato selection, inspection, and treatment.

[Sugar cane diseases, Hawaii], H. P. AGEE (*Proc. Hawaii. Sugar Planters' Assoc., 38* (*1918*), *pp. 159–161, 168–170*).—In these portions of the director's report, dated October 28, 1918, it is stated that cane varieties infected by the eye spot disease (which is locally severe, although certain varieties are practically immune) are more severely attacked by leaf hoppers. Lahaina cane disease has not been shown to be caused by black alkali. Ring spot (*Leptosphaeria sacchari*) is far more widely distributed than eye spot disease. Nematode attacks, while more serious than formerly on cane, are noticeably so on garden crops.

[Lahaina cane attacked by nematodes], H. P. Agee (*Proc. Hawaii. Sugar Planters' Assoc., 38 (1918), pp. 203–212*).—Nematode attack may be responsible for the deterioration of Lahaina cane, according to evidence presented. The Italian lupine, being more susceptible, encourages the persistence and spread of nematodes. The jack bean is nearly or quite immune. A disease attacking sugar cane, regardless of variety, resembles in some respects sereh as noted in Java. Other diseases also discussed include yellow tip, Pahala blight, and chlorosis.

The resistance of cane varieties to the yellow stripe or mosaic disease, F. S. Earle (*Porto Rico Sta. Bul. 19 (1919), pp. 15, fig. 1*).—The author describes rather extensive variety tests with sugar cane made in a district heavily infected with the mosaic or mottling disease in an effort to secure resistant strains. A tabulated statement is presented showing the general condition and probable tonnage of each variety as compared with Rayada.

Of 156 kinds, 40 were classified as more susceptible to the disease than Rayada, 42 as about equally susceptible, and 73 as more resistant. Kavangire, a sort said to have been introduced from Argentina, proved to be entirely immune and produced at the rate of 70 tons per acre, far in excess of the other varieties tested. Java-56 and Java-234, while in no sense immune, appeared to be so tolerant of the disease as to be of considerable value for planting in heavily infected areas. A variety known as Egyptian cane was also observed to resemble closely the Java canes in disease resistance.

The more important fruit tree diseases of Ontario, J. E. Howitt and L. Caesar (*Ontario Dept. Agr. Bul. 257 (1917), pp. 44, figs. 31*).—The object of this bulletin is to furnish information regarding identification and treatment adequate to recognize and control the more common diseases of fruit trees. Injuries due to other causes are discussed.

Monilia on [orchard] fruits, O. Appel (*Deut. Landw. Presse, 44 (1917), No. 48, pp. 379, 380, pl. 1, fig. 1*).—This is an account of the behavior of Monilia attacking fruits, leaves, and stems of cherry, peach, plum, pear, and apple.

Silver leaf disease, J. Bintner (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 6–7 (1919), pp. 241–263, pl. 1, figs. 8*).—A bibliographical and personal study of silver leaf disease of fruit trees is noted.

The spread and virulence of this disease during recent years is thought likely to hamper seriously the fruit-growing industry unless efficient and general action is taken. The disease is caused by *Stereum purpureum*. A disease closely similar but rarely found, designated as false silver leaf, is thought to be due to some physiological weakness. Both of these forms are described.

Diseases of apple, R. A. Saccá (*Bol. Agr. [Sao Paulo], 19. ser., No. 5–7 (1918), pp. 430–433, fig. 1*).—The fungi noted as attacking apple foliage are *Ascochyta* sp., *Pleospora herbarum*, and *Sphærella pomicola*.

Pear tree diseases, R. A. Saccá (*Bol. Agr. [Sao Paulo], 20. ser., No. 1–3 (1919), pp. 47–53*).—Organisms named as found in connection with disease in various parts of pear trees include *Stilbum* sp., *Collybia* sp., *Dendrophoma* sp., and *Rosellinia necatrix*.

Reversion and resistance to big bud in black currants, A. H. Lees (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1918, pp. 25–28; also in Jour. Bath and West and South. Counties Soc., 5. ser., 13 (1918–19), pp. 140–143*).—In continuation of work previously noted (E. S. R., 39, p. 646), the author describes reversion in black currants as characterized by a decrease in size and number of the fruits, extensive growth of laterals resulting in a rather dense bush, abnormally long and thin internodes, sharp pointed, abnormally narrow leaves, and more than ordinary serration. It usually appears gradually, affecting often only parts of a bush at the outset. Descriptions are given of wood and *Rosellinia necatrix.*

Examinations during two seasons at Long Ashton showed that badly reverted bushes were practically always attacked by big bud during the following winter. It is not yet certain that bushes attacked by mites tend to revert.

Five cases of reversion are described with discussion.

[Treatment of grape disease, 1916], V. C. M. Zúñiga (*Estac. Enol. Haro Mem., 1916, pp. 25–46, pl. 1*).—This section of the report includes an account in detailed and tabular form, with discussion, of tests, with standard and proprietary fungicides against grape Oïdium and downy mildew.

Grape downy mildew, A. Pachano (*Quinta Norm. Estac. Expt.* [*Ambato, Ecuador*], *Circ. 9* (*1918*), *pp. 8*).—This is a general account of grape downy mildew in portions of South America.

Gummosis in grape vines, C. B. de Arís (*Bol. Agr. Téc. y Econ., 10* (*1918*), *No. 109, pp. 36–41*).—A brief account is given of a gummosis of grape vines used as replants. The trouble seems to be due to bacteria of undetermined classification. Treatments are outlined.

Citrus canker eradication in the State of Florida, W. Newell (*Cal. Citrogr., 4* (*1919*), *No. 11, pp. 313, 323, fig. 1*).—The results achieved in combating citrus canker since its discovery in Florida in 1913 are considered to demonstrate the possibility of eradicating a plant disease. A brief account of this contest is given. The disease is said to have been found in 481 citrus growing properties in Florida, and it has been eradicated from 292 of these properties. Of the 189 remaining, 183 are classed as dangerous, sufficient time not having elapsed to insure against the possibility of further infection, and 6 are here discussed as actually infected and subject to very intensive weekly inspection amounting practically to examination of each leaf on every tree.

Internal browning of lemons, J. T. Barrett (*Cal. Citrogr., 4* (*1919*), *No. 11, p. 292, fig. 1*).—This address dealt mainly with definitions and terms regarding the disease attacking lemons often designated as stem-end decay. The breaking down of the tissues in the fruit presents two aspects, and is divided into membraneous strain and internal decline of the lemon. These changes usually follow such extreme conditions as the freeze of 1913 or the heat wave of 1917, and are more evident in the ripe fruits. Further details are to appear later.

[Lemon stem-end rot in California] (*Cal. Citrogr., 4* (*1919*), *No. 11, p. 289*).—It is stated that this rot, which affects the heart of the fruit, is becoming the most serious disease which has attacked the lemon for some years in California.

A parasite of the tree fern Cyathea, F. L. Stevens and N. Dalbey (*Bot. Gaz., 68* (*1919*), *No. 3, pp. 222–225, pls. 2*).—A description is given of a fungus growth on leaves of *C. arborea* collected at points in Porto Rico in 1915. The fungus is regarded as belonging to a new genus, and is described under the name *Griggsia cyathea.*

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Life and writings of Professor F. E. L. Beal, W. L. McAtee (*Auk, 34* (*1917*), *No. 3, pp. 243–264, pl. 1*).

Annual report of the Government entomologist for 1918–19, A. H. Ritchie (*Ann. Rpt. Dept. Agr. Jamaica, 1919, pp. 26–30*).—This reports upon the occurrence of the more important insects of the year, with recommendations for their control.

[Economic insects in Dominica], J. C. Hutson (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Dominica, 1917–18, pp. 15–17*).—Data here presented relate to damage to staves of puncheons and other packages used for exporting lime juice, particularly raw juice, by *Xyleborus* sp. and injury to guava by *Anastrepha acidusa*, the only fruit fly as yet recorded from Dominica.

Annual report for 1918 of the zoologist, C. Warburton (*Jour. Roy. Agr. Soc. England, 79 (1918), pp. 258–263*).—This report deals briefly with the occurrence of the more important insects of the year.

[Economic insects in Sweden] (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 139 (1916), pp. 8, figs. 8; 1918, Nos. 164, pp. 16, pl. 1, figs. 12; 167, pp. 11, figs. 6; also in K. Landtbr. Akad. Handl. och Tidskr., 56 (1917), No. 1, pp. 37–42, figs. 8; 57 (1918), Nos. 3, pp. 202–214, pl. 1, figs. 12; 4, pp. 269–277, figs. 6*).—Papers are presented on species of considerable importance in Sweden, namely, The Stalk Borer (*Phytoecia cylindrica*), which is particularly important as an enemy of carrots through its attack on the seed stalks, by N. A. Kemner; and The Apple Twig Borer (*Blastodacna putripennella*), which is increasing in importance in orchards in southern Sweden; and The Leek Moth (*Acrolepia assectella*), which has appeared as an enemy of the leek in the northeastern part of the Province of Småland, both by A. Tullgren.

[Contributions on economic insects] (*Ztschr. Angew. Ent., 3 (1916), No. 2, pp. 197–366, figs. 50; 4 (1917), No. 2, pp. 189–334, figs. 29*).—The papers presented in the first of these numbers include the following: May Beetle Economy and Forestry, by Puster (pp. 197–203); The Fly Pest in House and Hospital, by V. Haecker (pp. 204–209); The Conditions for Successful Silk Culture and Their Economic Importance, by J. Bolle (pp. 210–256); Manuring and Insect Control, by Hoffmann (pp. 257–262); The Olfactory Sense of the Body Louse (*Pediculus humanus* [*corporis, vestimenti*]), by H. W. Frickhinger (pp. 263–281); On the Report of the Royal Institute for Bee Culture in Erlangen, 1915, by E. Zander (pp. 282–287); A New Zoological Laboratory of the Royal Forest Academy in Eberswalde, by M. Wolff (pp. 289–298); etc.

Among the papers presented in the second number are the following: Plant Inspection as a Protection against the Introduction of Insect Pests, by L. Reh (pp. 189–237); The Life History, Economic Importance, and Control of the Gall Mite, *Oxypleurites carinatus*, by K. H. C. Jordan (pp. 238–266); Important Questions in Bee Culture, by T. Roemer (pp. 267–273); A Severe Outbreak of *Byctiscus betulæ* in Rhine Province in the Spring of 1917 (pp. 274–277) and Hydrocyanic Acid against the Traubenwickler (pp. 278–286), both by F. Stellwaagf; Control of the Bee Moth (*Galleria melonella*) through the Use of Hydrocyanic Acid, by E. Teichmann (pp. 287–289); Summer Combating of the Mosquito, by E. Bresslau and F. Glaser (pp. 290–296); The Control of the Bedbug (*Cimex lectularius*) by Use of Hydrocyanic Acid, by A. Hase (pp. 297–309); The Use of Hydrocyanic Acid Fumigation in Combating Insect Enemies of Flour.—Report on a Simple Method of Fumigating the Flour, by H. W. Frickhinger (pp. 310–324); The Biology of the Wheat Bulb Fly (*Hylemyia coarctata*), by E. Molz (pp. 325, 326); Winter Combating of the Mosquito, by E. Bresslau (pp. 327–331); and the Cabbage Butterfly [*Pieris brassicæ*] in Switzerland in the Summer of 1917, by A Hess (pp. 332–334).

Report on the work of the entomological division, E. R. Speyer (*Ceylon Admin. Rpts. Sect. IV, Rpt. Dir. Agr., 1918, pp. C11–C13*).—A brief report on the occurrence of and work of the year with the more important insect pests, to which is appended a brief report by N. K. Jardine on a special investigation of the tea tortrix.

Entomology, J. McSwiney (*Rpt. Agr. Dept. Assam, 1919, pp. 6–8*).—Observations of the more important insects of the year are reported upon.

The pink bollworm, the boll weevil, and Lower California cotton, A. O. Pratt (*Mo. Bul. Cal. Comm. Hort., 8 (1919), No. 5, pp. 266, 267*).—The author concludes that the northern district of Lower California is adequately protected against the introduction of dangerous cotton insects, and that there is no danger to California cotton in permitting the entry of the Mexican-grown product.

Control of the principal insects injurious to the apple above ground, T. J. Headlee (*Mass. State Dept. Agr. Circ. 9 (1919), pp. 11*).—A popular account.

Insects in their relation to forestry, R. W. Shufeldt (*Sci. Amer. Sup., 38 (1919), No. 2288, pp. 320, 321, figs. 6*).—A popular account.

Observations on the relation of insects to the dissemination of Cronartium ribicola, W. H. Snell (*Phytopathology, 9 (1919), No. 10, pp. 451–464*).—In the course of observations conducted in June, 1917, the author found a number of species of insects, chiefly beetles, on or near blister-rust lesions on white pine, bearing æciospores in varying quantities. "One beetle (*Serica sericea*) was collected feeding upon a red currant bush and bore æciospores on its body. Slugs, spiders, and many species of insects are habitual frequenters of or casual visitors to Ribes bushes, wild or cultivated.

"Many species of insects were found in 1918 to bear urediniospores from infected leaves, some in large quantities. Sporidia were found in a few cases on ants. One insect (*Neodiprion pinetum*) collected upon Ribes is known to feed upon *Pinus strobus*. Inoculations prove that insects may spread the urediniospore stage from bush to bush. Hence, while the spread of *C. ribicola* by the agency of insects from pine to Ribes or vice versa may be infrequent and accidental, the spread of the uredinial stage upon Ribes probably occurs with some regularity."

[Work with stored grain insects] (*Rpts. Grain Pests (War) Com. Roy. Soc. [London], No. 4 (1919), pp. 20, fig. 1*).—In this fourth report (E. S. R., 40, p. 855) three papers are presented, namely, Report on the Effect of Various Gaseous Reagents upon the Flour Moth (*Ephestia kuehniella*) and Other Pests Found in Flour, by J. S. Edkins and N. Tweedy (pp. 3–13); On the Phenomenon Known as "Webbing" in Stored Grain, by A. Dendy and H. D. Elkington (pp. 14–17); and Note on the Occurrence of Live Insects in Tins Supposed to be Hermetically Sealed, by A. Dendy (pp. 18–20).

Contribution to the study of the microbe parasites of insects.—Study of Bacillus hoplosternus, A Paillot (*Ann. Inst. Pasteur, 33 (1919), No. 6, pp. 403–419, figs. 8*).—Of the insects experimented with, which included the gipsy moth, brown-tail moth, *Vanessa urticæ*, *Malacosoma neustria*, *Chelonia caja*, the common cockchafer, and *Rhyzotrogus solsticialis*, only the gipsy moth larvæ offered resistance to the multiplication of *B. hoplosternus* in the blood. As a general rule the caterpillars of this species are but slightly susceptible to the inoculation of parasitic microbes, the coccobacilli excepted. But few of the caterpillars were found to be infected under natural conditions, particularly during the first stage of the invasion. Toward the end of the invasion the bacilli are more common among the weakened individuals and the cases of immunity less frequent.

Combined Bordeaux oil emulsion spray, C. A. Macrum (*Bien. Rpt. Bd. Hort. Oreg., 15 (1917–18), p. 82*).—The combined Bordeaux oil emulsion spray has been used by the author in Oregon with success. When applied as the buds are opening, before the blossoms appear it will control scab, San José scale, aphis, leaf roller, red spider, and leaf curl of the peach. The copper will be present to prevent the ravages of the anthracnose spores when the rains come in the fall of the year, and control the disease in prunes due to the Cylindrosporium.

"The method of preparation is as follows: Prepare the copper sulphate solution in the usual proportions of 1 lb. to the gallon of water, dissolve 1.5 lbs. of common glue in 1.5 gal. of water, slack 12 lbs. of lime, or stir 12 lbs. of hydrated lime in water at time of using. Fill a 200 gal. spray tank three-fourths full of water. Pour 24 gal. of bluestone solution into the tank, start the agitator, and add the lime milk slowly until a neutral solution is had. Test with litmus paper to tell when the solution is neutral. Add the 1.5 gal. of glue solution. Measure out 12 gal. of the General Chemical Company's No. 1 oil emulsion, or a corresponding oil emulsion, add a little water, and stir until emulsion is started as shown by the mixture turning milky. Pour into the spray tank and add water to make 200 gal. The agitator must be kept running during the whole procedure. The spray should be applied as soon as prepared. The above are proportions for a 200-gal. tank."

Faunistic notes on the Swedish Thysanoptera by the late Dr. F. Trybom, A. Tullgren (*Ent. Tidskr., 38 (1917), No. 1, pp. 33–61*).—The list presented includes the distribution, habits, and host plants of the Swedish Thysanoptera, of which 54 species representing 28 genera are recorded.

New genera and species of Australian Thysanoptera, J. D. Hood (*Mem. Queensland Mus., 6 (1918), pp. 121–150*).—In this paper descriptions are given of 24 new species of thrips collected in the coastal region of north Queensland. Four genera, namely, Pterothrips, Phibalothrips, Euoplothrips, and Phaulothrips, are erected.

On some new Thysanoptera from southern India, J. D. Hood (*Insecutor Inscitiæ Menstruus, 7 (1919), No. 4–6, pp. 90–103, pls. 2*).—Six species are described as new and the genera Perissothrips and Arrhenothrips are erected.

On some new Idolothripidæ (Thysanoptera), J. D. Hood (*Insecutor Inscitiæ Menstruus, 7 (1919), No. 4–6, pp. 66–74, pls. 2*).—Three species are described as new and the genera Ophthalmothrips and Cercothrips are erected.

Grasshoppers and control measures, T. D. Urbahns (*Mo. Bul. Dept. Agr. Cal., 8 (1919), No. 9, pp. 518–528, figs. 8*).—The manner in which grasshoppers may be controlled is pointed out, and brief reference is made to the most destructive species occurring in California.

Notes on two Miridæ, Camptobrochis and Paracalocoris (Heteroptera), W. L. McAtee (*Ent. News, 30 (1919), No. 9, pp. 246, 247*).

The genus Gargaphia (Tingidæ; Heteroptera), E. H. Gibson (*Trans. Amer. Ent. Soc., 45 (1919), No. 3, pp. 187–201*).—The author recognizes 25 species of this genus, which is limited in its distribution to North, Central, and South America, of which 5 species are herein described as new. Several of the species are of economic importance as plant feeders.

Internal parasites of Michigan Coccidæ, E. McDaniel (*Ann. Rpt. Mich. Acad. Sci., 20 (1918), p. 141*).—The author lists 5 species as parasitic upon the walnut scale, 10 upon the San José scale, 2 upon the oyster-shell scale, and 1 upon *Lecanium hesperidum* in Michigan. Determinations of the parasites were made by H. T. Fernald.

Some notes on the natural control of the oyster-shell scale (Lepidosaphes ulmi), J. D. Tothill (*Bul. Ent. Research, 9 (1919), No. 3, pp. 183–196, figs. 7*).—This is a more extended account of the author's investigations on the natural control of the oyster-shell scale in Canada, especially eastern Canada, than that previously noted (E. S. R., 39, p. 162), in which *Hemisarcoptes malus*, the most important natural enemy, is dealt with.

"Overcrowding, parasitism by *Aphelinus mytilaspidis*, and destruction by *H. malus*, are in Canada the most important factors in the natural control of the mussel scale. Of these the last is by far the most important. As hundreds of the mites can be sent through the mail on an apple twig, it should be possible to colonize it in scale-infested places and countries where it may prove to be absent from the local fauna."

New aphids from oaks, W. M. DAVIDSON (*Canad. Ent., 51 (1919), No. 11, pp. 245–248, fig. 1*).—Two species and a variety collected from Quercus in California are described as new, namely, *Vacuna californica, Myzocallis quercifolii,* and *M. californicus pallidus.*

Another Toxoptera feeding on sedge (Homoptera; Aphididæ), A. C. BAKER (*Psyche, 25 (1918), No. 4, pp. 88–93*).—An aphid taken from sedges in a marsh at East Falls Church, Va., is described as new under the name *Toxoptera nigra.*

Gallobelicus nicotianæ of Koningsberger, J. E. A. DEN DOOP (*Bul. Deli Proefsta. Medan, No. 12 (1919), pp. 9*).—This is an account of a green capsid, first described by Koningsberger in 1903, that is a source of injury to tobacco in Deli.

Anoplura from South African hosts, G. A. H. BEDFORD (*Rpts. Dir. Vet. Research, Union So. Africa, 5–6 (1918), pp. 709–736, figs. 13*).—This is an annotated list of South African lice, based upon laboratory material collected in large part in the Transvaal. Eighty-one species, 6 of which are new to science, representing 28 genera are listed.

A list of Coccidæ affecting various genera of plants, E. E. GREEN (*Ann. Appl. Biol., 4 (1918), Nos. 3, pp. 75–89; 4, pp. 228–239; 5 (1918), No. 2, pp. 143–156; 5 (1919), No. 3–4, pp. 261–272*).—A generic host list of the scale insects.

The Coccidæ of South Africa, I–III, C. K. BRAIN (*Trans. Roy. Soc. So. Africa, 5 (1915), pt. 2, pp. 65–194, pls. 13, figs. 38; Bul. Ent. Research, 9 (1918), Nos. 2, pp. 107–139, pls. 5; 3, pp. 197–239, pls. 5*).—The first paper deals with 63 species, of which 31 are described as new and the genus Natalensia is erected; the second describes 33 additional species, of which 12 are new to science and two genera, namely, Grewiacoccus and Calycicoccus, are erected; and the third paper deals with 50 species, of which 20 are described as new.

The olfactory sense of lepidopterous larvæ, N. E. MCINDOO (*Ann. Ent. Soc. Amer., 12 (1919), No. 2, pp. 65–84, figs. 53*).—"To determine whether lepidopterous larvæ respond to chemical stimuli, tent caterpillars, fall webworms, tussock moth larvæ, army worms, and larvæ of *Papilio polyxenes* were tested by using the following sources of odors: Oils of peppermint, thyme, and wintergreen, dried leaves of pennyroyal and spearmint, wild cherry-tree leaves, fresh grass, old honey and comb, and the protruded thoracic glands of the above Papilio larvæ. The larvæ usually responded to the exhalations from these substances, but the average reaction times obtained seemed to depend more on the degree of sluggishness of the larvæ than on their sensitiveness to odors.

"Organs, called olfactory pores by the writer, but known as punctures to systematists, were found widely distributed on the head capsule, head appendages, legs, dorsal surfaces of the prothorax, and last abdominal segment, and on the anal prolegs. It is believed that a few of those on the head and all of those found on the legs and abdomen are here reported for the first time. Their internal structure is like that of those in adult insects and coleopterous larvæ, and consequently are well adapted to receive chemical stimuli, because their sensory fibers running from the sense cells pass into the minute pores or punctures and seem to come in direct contact with the external air. No experiments, however, were performed to determine their function.

"Verschaffelt determined experimentally that cabbage butterfly larvæ are attracted by the various mustard oils contained in the host plants, and this explains why these larvæ refuse plants not containing such oils; he also thinks that the larvæ smell the odors from the mustard oils before they begin to eat the food. If we knew more about the chemotaxis of insects, we might be able to devise practical methods for the control of certain insects, as by trap baits, etc."

Physiological and parasitological studies of economic Lepidoptera.—Parthenogenesis in Apanteles glomeratus, C. GAUTIER (*Compt. Rend. Soc. Biol.* [*Paris*], *82* (*1919*), *No. 24, pp. 1000–1002*).—In continuation of previous studies (E. S. R., 41, p. 751), the author finds this parasite to be capable of reproduction parthenogenetically.

Some new tropical American moths, H. G. DYAR (*Insecutor Inscitiæ Menstruus, 7* (*1919*), *No. 4–6, pp. 74–85*).

The common cabbage worm in Wisconsin (Pontia rapæ), H. F. WILSON, R. C. PICKETT, and L. G. GENTNER (*Wisconsin Research Bul. 45* (*1919*), *pp. 35, figs. 11*).—Serious injury to cabbage in Wisconsin during the three years preceding and the fact that many canners refused to buy or use sprayed cabbage led to investigations of the imported cabbage worm in Wisconsin and means for its control, here reported.

Brief accounts of the spread of this insect following its introduction into North America at Quebec, Canada, about 1859, its food plants, and nature and extent of injury are followed by a report of life history studies conducted during the years 1916 and 1917, data relating to which are presented in tabular form.

There are three generations each year in the vicinity of Madison. Eggs to the number of 238 were observed to be deposited within a period of 5 days, larvæ hatching out in from 3 to 10 days following. The average period in the egg stage for the three generations during 1916 and 1917 varied from 4 to 6.5 days, the first larval instar from 2 to 8 days, the second from 2 to 4⅜ days, the third from 2 to 4.5, the fourth from 2.5 to 6, and the fifth from 3.5 to 17.5, the average larval period varying from 12.66 to 34.5 for the three generations, of the pupa from 7 to 34.5 days for the first two generations. The average period from egg to adult for the first two generations during the two years varied from 26 to 47.75 days. The average period of development for the first generation was 54.7 and for the second 26 days in 1916 and 23 days for the second generation in 1917.

Two hymenopterous parasites were observed in Wisconsin which destroy large numbers of the larvæ and pupæ, namely, *Pteromalus puparum* and *Apanteles glomeratus*. Flacherie may also cause many deaths. In spraying and dusting experiments arsenicals, including arsenate of lead, calcium arsenate, and Paris green, were demonstrated to be effective means of control. The first two should be used at the rate of 1 lb. powder or 2 lbs. paste, and the last mentioned at the rate of 0.75 lb., to 50 gal. of water. Arsenate of lead and calcium arsenate used as a dust were effective when dusted at a rate as low as 1 lb. to 50 lbs. of lime. The details of artificial control experiments are given in tabular form. It was demonstrated that arsenicals can be applied without any danger to the consumer from arsenical poisoning.

A list of 70 references to the literature is included.

Control work with the grapevine cochylis in Vaudois vineyards in 1918, H. FAES (*Essais et Traitements Effectués dans le Vignoble Vaudoise contre le Ver de la Vigne* (*Cochylis*), *en 1918. Lausanne: Sta. Vitic. Lausanne, 1919, pp. 12*).—A report of control work conducted during the year (E. S. R., 40, p. 456).

Notes on the larch case bearer (Coleophora laricella), H. T. FERNALD (*Canad. Ent., 51 (1919), No. 11, p. 264*).—The author reports the reappearance of this case bearer at Northampton, Mass., and its injury to a number of good-sized larches through the thorough mining of the outer half of the leaves.

Notes on Cosmopterygidæ, with descriptions of new genera and species, A. F. BRAUN (*Ent. News, 30 (1919), No. 9, pp. 260–264*).—Two genera, namely, Periploca and Amaurogramma, are erected and four species are described as new. *Psacaphora metallifera* of Walsingham is recorded as reared from larvæ mining the leaves of *Cuphea petiolata*, and *Cosmopteryx clemensella* of Stainton is said to mine the overwintering leaves of *Carex laxiflora latifolia*. *C. opulenta* n. sp. was reared from irregular mines on *Ambrosia psylostachya* at Rivera, Cal.

A new olethreutid from New York, C. HEINRICH (*Insecutor Inscitiæ Menstruus, 7 (1919), No. 4–6, pp. 65, 66, pl. 1*).—*Olethreutes approximana*, the larvæ of which roll the terminal leaves of loosestrife at Rensselaer, N. Y., is described as new.

Tinea cloacella bred from fungi, H. B. WEISS (*Ent. News, 30 (1919), No. 9, pp. 251, 252*).—This tineid is recorded as having been reared at Matawan, N. J., from *Polyporus sulphureus* and at New Brunswick, N. J., from *P. tsugæ*. The larvæ feed in the context of the fungus and pupate in the tubes, the winter being passed in the larval stage and pupation taking place the following spring.

A new genus in the dipterous family Cyrtidæ from South America, F. R. COLE (*Ent. News, 30 (1919), No. 10, pp. 271–274, pl. 1*).—The genus Camposella is erected with *C. insignata* n. sp. from Ecuador as the genotype.

New genera and species of muscoid flies, C. H. T. TOWNSEND (*Proc. U. S. Natl. Mus., 56 (1919), pp. 541–592*).—This paper includes descriptions of 77 genera and 77 species new to science.

Facts concerning Phormia azurea, a muscid with bloodsucking larvæ parasitic on birds in Europe, E. ROUBAUD (*Bul. Biol. France et Belge, 51 (1917), No. 4, pp. 420–430, pl. 1; abs. in Rev. Appl. Ent., Ser. B, 6 (1918), No. 8, p. 155*).—The habits of this parasitic muscid appear to be the same in Europe as those observed by Plath in California (E. S. R., 40, p. 647).

The crane flies of New York.—I, Distribution and taxonomy of the adult flies, C. P. ALEXANDER (*New York Cornell Sta. Mem. 25 (1919), pp. 771–993, figs. 366*).—The author here reports studies of the families Tanyderidæ, Ptychopteridæ, Rhyphidæ, and Tipulidæ. Since almost any species occurring in northeastern America may be found within the limits of New York State, the work has been extended to include the northeastern United States and eastern Canada, Labrador, and Newfoundland, south to Virginia and Kentucky, and west to Iowa, Minnesota, and Manitoba It is believed that this area includes about all of the local probabilities, but with some new species yet to be discovered and lost species to be recognized. The total number of species of crane flies that should occur in the State is thought to be not less than 800.

The work includes a detailed account of the museum and other sources of the material studied, accounts of the systematic position of the species, their economic importance, distribution, and lists of species occurring in Maine, New Brunswick, Nova Scotia, Quebec, Newfoundland, Labrador, and Washington, D. C., and vicinity. A list of the species collected in New York State by counties, with the localities in which collected and names of collectors, is followed by data on the distribution of the Tipulidæ and related families by life zones. The morphology of the immature and adult stages is dealt with at length, and followed by keys for the separation of the genera and species occurring in northeastern North America.

A list of 42 references to the literature cited is included.

The horn-fly in Porto Rico, E. G. Smyth (*Rev. Agr. Puerto Rico, 3 (1919), No. 5, pp. 11–24, figs. 8*).—A summary of information on this pest and directions for control work under conditions occurring in the island.

The lantana fly (Agromyza lantanæ), W. W. Froggatt (*Agr. Gaz. N. S. Wales, 30 (1919), No. 9, pp. 665–668, figs. 6*).—The author presents a brief account of the lantana fly, and records the discovery in May of the true lantana fly or a closely allied species in New South Wales.

Notes on the seasonal activity of Tabanidæ in the Lower Everglades of Florida, C. A. Mosier and T. E. Snyder (*Proc. Ent. Soc. Wash., 21 (1919), No. 8, pp. 186–196, pl. 1*).

A note on Argentine mosquitoes (Diptera, Culicidæ), H. G. Dyar (*Insecutor Inscitiæ Menstruus, 7 (1919), No. 4–6, pp. 85–89*).

The mosquitoes collected by the Canadian Arctic Expedition, 1913–1918, H. G. Dyar (*Rpt. Canad. Arctic Exped. 1913–1918, vol. 3, pt. C (1919), pp. 31c–33c, figs. 2*).

Preliminary report of the Antimalarial Commission, P. M. Tottenham et al. (*Cairo, Egypt: Govt., 1919, pp. VIII+55, pls. 7*).—This preliminary report relates to an examination made into the presence and extent of malaria in Egypt. Information is given on the breeding places of anophelines and a detailed account of the antimalarial measures in effect in specified centers and localities.

Notes on forest insects.—II, Notes on several species of Pityophthorus breeding in the limbs and twigs of white pine, M. W. Blackman (*Psyche, 26 (1919), No. 5, pp. 134–142, pls. 3*).—In this second paper (E. S. R., 41, p. 758) notes are given on *Pityophthorus carinicepa*, *P. canadensis*, *P. granulatus*, *P. nudus*, and *P. puberulus*.

Notes on the North American species of Hippodamia (Coleoptera), P. H. Timberlake (*Jour. N. Y. Ent. Soc., 27 (1919), No. 2–3, pp. 162–174*).—Thirteen species of this genus of ladybird beetles are recognized by the author.

Notes on Eustrophus bicolor, bred from fungi (Coleoptera), H. B. Weiss (*Psyche, 26 (1919), No. 5, pp. 132, 133*).—The author records the rearing of this beetle from larvæ found feeding in *Pleurotus sapidus* at Monmouth Junction, and in *Polyporus squamosus* at Union, N. J.

Pulse beetles (store forms), K. Kunhi Kannan (*Dept. Agr. Mysore, Ent. Ser. Bul. 6 (1919), pp. 31, pl. 1, figs. 18*).—This bulletin deals with the weevils attacking pulses, including gram, lablab, peas, and beans, particularly (*Bruchus*) *Pachymerus chinensis*, their natural enemies, and control measures.

The structure, bionomics, and forest importance of Cryphalus abietis, W. Ritchie (*Ann. Appl. Biol., 5 (1919), No. 3–4, pp. 171–199, figs. 15*).—The scolytid beetle here considered, which is one of the two species that work on coniferous trees in Great Britain, has until quite recently been considered rare in Great Britain, but is now appearing in Scotland in increasing numbers.

In the present paper, investigations of its life history and habits made in Aberdeenshire and Kincardineshire and anatomical studies and breeding experiments made in the laboratory at Edinburgh are reported upon. In Scotland *C. abietis* breeds on the stems, branches, and twigs of unhealthy, dying, or dead trees of Abies, Picea, and Pseudotsuga.

A cerambycid infesting pine cones in India, Chlorophorus strobilicola n. sp., H. G. Champion (*Ent. Mo. Mag., 3. ser., 5 (1919), No. 58, pp. 219–224, pls. 2, fig. 1*).—A biologic and systematic account of a cerambycid reared at various times from the cones of *Pinus longifolia* in India.

Descriptions of new North American Ptinidæ, with notes on an introduced Japanese species, W. S. Fisher (*Proc. Ent. Soc. Wash., 21 (1919), No.

8, pp. 181–186).—Four species are described as new, and the genus Neohedobia is erected.

European corn-borer investigations, Massachusetts and New York, C. G. Woodbury et al. (*Cong. Rec., 58 (1919), No. 138, pp. 8409–8411*).—This is a report of the status of *Pyrausta nubilalis* in the United States and a discussion of control measures considered advisable. It is based upon a field inspection by representatives from the State of Indiana, accompanied by members of the Federal Horticultural Board, the State entomologist of New York, and others, made in the infested area in eastern Massachusetts on October 8 and in the infested area near Schenectady, N. Y., the following day.

Note on Pyrausta nubilalis in the vicinity of Brussels, G. de Crombrugghe de Picquendaele (*Rev. Mens. Soc. Ent. Namur., 19 (1919), No. 4, pp. 17–19; abs. in Rev. Appl. Ent., Ser. A, 7 (1919), No. 9, p. 373*).—The European corn borer is abundant in and around Brussels wherever its chief food plant (*Artemisia vulgaris*) occurs, in spite of remedial measures and cultivation of the soil. Among the food plants that have been recorded are hops, maize, hemp, millet, *Inula conyza*, and *Phragmites communis*.

The alfalfa weevil and methods of controlling it, G. I. Reeves, P. B. Miles, T. R. Chamberlin, S. J. Snow, and L. J. Bower (*Bien. Rpt. Bd. Hort. Oreg., 15 (1917–18), pp. 83–98, figs. 7*).

[The mango weevil in Bengal], S. Milligan (*Rpt. Dept. Agr. Bengal, 1917–18, pp. 5, 6*).—It was discovered during the year that the mango weevil oviposits when the fruit has attained half its natural size, the eggs being laid singly in small depressions on the surface of the fruit and covered over by a coating of a black substance giving the appearance of black spots. It is thought that this discovery and that of the fact that oviposition extends over a period of not longer than two weeks will render remedial measures practicable.

The pepper weevil (Cryptorhynchus cubæ), R. Hart (*Rev. Agr. Com., y Trab. [Cuba], 2 (1919), No. 9, pp. 455, 456, figs. 4*).—A brief account of this enemy of *Capsicum* spp. in Cuba, where in the Provinces of Pinar del Rio and Habana it is a source of much injury, together with brief notes on other species, including *C. lapathi*, *Sternochetus* (*C.*) *mangiferæ*, *S.* (*C.*) *gravis*, and *Eucepes* (*C.*) *batatæ*.

On the peach sawfly, T. Harukawa (*Byochu-Gai Zasshi* (*Jour. Plant Protec.* ([*Tokyo*], *6 (1919), No. 1, pp. 47–59, pl. 1; abs. in Rev. Appl. Ent., Ser. A, 7 (1919), No. 7, p. 273*).—Under the name *Eriocampoides matsumotonis* the author describes a new sawfly which attacks the peach, pear, cherry, and plum in Japan. This species is said to be closely allied to *E. limacina* of Europe and America, from which it may be distinguished by the sooty tint of the winds.

Some chalcid wasps reared from cecidomyid galls, A. B. Gahan (*Ann. Ent. Soc. Amer., 12 (1919), No. 2, pp. 159–170*).—Of the 11 species here noted 8 are described as new to science.

A new chalcid fly parasitic on the Australian bulldog ant, C. T. Brues (*Ann. Ent. Soc. Amer., 12 (1919), No. 1, pp. 13–23, figs. 5*).—Under the name *Psilogaster fasciiventris* the author describes a new species reared from the cocoon of *Myrmecia gulosa* in New South Wales, together with its several stages.

The parasitic Aculeata, a study in evolution, W. M. Wheeler (*Proc. Amer. Phil. Soc., 58 (1919), No. 1, pp. 1–40*).—This paper includes a bibliography of five pages.

On the hymenopterous parasites of Kermes, L. O. Howard (*Ent. News, 30 (1919), No. 9, pp. 255–259*).—The author presents a list of the hymenopterous parasites of Kermes, which is based upon reared specimens in the notes and collections of the Bureau of Entomology of the U. S. Department of Agriculture and the National Museum and a review of the literature. A note by H. Morrison on the list of species reared by Giraud from Kermes, which was annotated by Laboulbène and published in 1877, is appended.

An economic study of Nasonia brevicornis, a hymenopterous parasite of muscid Diptera, J. L. Froggatt (*Bul. Ent. Research, 9 (1919), No. 3, pp. 257–262*).—The author here presents an account of *N. brevicornis*, a hymenopterous parasite first described by Girault and Sanders who reared it from the pupæ of the house fly at Urbana, Ill. (E. S. R., 23, p. 161). This was found in the fall of 1913 to heavily parasitize the pupæ of *Pycnosoma (Calliphora) rufifacies* in New South Wales.

Marked success has been met with in rearing and distributing this species. It is pointed out that it is seldom that such a hardy and easily bred parasite as *N. brevicornis* has been found. As they remain in the pupæ a considerable time, they can be dispatched long distances without very much danger of premature emergence and with ordinary care can be fed and kept for days before liberation. The author concludes that the species should prove a very important factor in the control and reduction of blow-flies and even other species of Diptera.

The progress of Scolia manilæ in Hawaii, F. Muir (*Ann. Ent. Soc. Amer., 12 (1919), No. 2, p. 171*).—The author reports an enormous decrease in the infestation of sugar cane by *Anomala orientalis* due to parasitism by *S. manilæ*. This parasite has extended its range beyond the area infested by *A. orientalis* and is now working on *Adoretus tenuimaculatus*, a beetle common all over the archipelago.

The ants of the British Solomon Islands, W. M. Mann (*Bul. Mus. Compar. Zool., 63 (1919), No. 7, pp. 275–391, pls. 2, figs. 59*).

Leaf-cutting ants and means of control, B. T. Barreto (*Estac. Expt. Agron. Cuba Bol. 42 (1919), pp. 17, figs. 8*).—A summary of information on control measures for *Atta insularis*.

Myrmecophilous insects from Cuba, W. M. Mann (*Psyche, 25 (1918), No. 5, pp. 104–106*).

The photic reactions of the honeybee, Apis mellifera, D. E. Minnich (*Jour. Expt. Zool., 29 (1919), No. 3, pp. 343–425, figs. 17*).—This is a detailed report of investigations conducted by the author.

Beekeeping in Oklahoma, C. E. Sanborn (*Okla. Agr. Col., Ext. Div. Circ. 106 (1919), pp. 26, figs. 15*).—A popular account.

Thirty-ninth annual report of the Beekeepers' Association of the Province of Ontario, 1918 (*Ann. Rpt. Beekeepers' Assoc. Ontario, 39 (1918), pp. 47*).—The proceedings of the annual meeting of the association are presented.

The common ticks of Nyasaland, with some special notes on the anatomy and biology of ticks in general, J. de Meza (*Nyasaland Dept. Agr. Bul. 1 (1918), pp. 32, pl. 1, figs. 12*).—Fourteen species are dealt with.

FOODS—HUMAN NUTRITION.

Some studies on the nutritive value of the soy bean in the human diet, W. G. Bowers (*North Dakota Sta. Spec. Bul., 5 (1919), No. 13, pp. 278–328, figs. 4*).—This comprises the report of an extensive investigation of the nutritive value of the soy bean in the human diet as determined by digestibility experiments with the human subject and feeding experiments with white rats. The experimental part is prefaced by a survey of the literature on the extent of the production of soy beans, the preparation of the beans in different countries for human consumption, the varieties and chemical composition, the character of the various constituents and their bearing on nutrition, and the digestibility of soy bean products.

The experimental data include determinations of the digestibility of soy cake meal and of the different carbohydrates as found in a representative variety of the soy bean, a study of the relative composition and digestibility of the meal and bran, and the results of an attempt to locate and eliminate the disagreeable and unpalatable substances present in the bean.

Digestion experiments with a mixture of one part of soy cake meal and two parts of patent wheat flour used in a yeast-raised bread, and in the form of a porridge cooked for several hours in a double boiler have been noted from another publication (E. S. R., 40, p. 557).

A more extended study of the digestibility of the different carbohydrates taken separately indicated that the sucrose, raffinose, dextrins, and starch were practically entirely digestible, the hemicelluloses (amounting to about 6 per cent) about 93 per cent digestible, and the cellulose about 77 per cent digestible.

By a suitable milling process the bran could be separated easily from the soy bean and was found to constitute about 8 per cent of the whole bean. The composition of the bran and meal was moisture 8.46 and 8.23 per cent, ash 4.42 and 4.6, fat 1.5 and 18.01, protein 5.81 and 40.99, crude fiber 37 and 1.7, nitrogen-free extract 42.81 and 26.47, CaO 0.8 and 0.27, and P_2O_5 0.27 and 1.52 per cent, respectively. Digestibility experiments on the bran indicated that the nitrogen-free extract was about 84 per cent digestible. No ill effects and no noticeable amount of gas resulted from the use of a diet consisting of well-cooked bran, but the diet was somewhat unpalatable.

No salicylic acid, hydrogen cyanid, or cyanates were found in either the bran or meal, a very slight trace of tannin was found in the meal but none in the bran, and a slight trace of alkaloids was found in both.

The presence of unpalatable substances in the soy bean was tested by means of feeding experiments with rats. Some of the unpleasant flavor appeared to be in the oil but more in the organic acids of the soy bean. The latter flavor was practically all removed by cooking which, however, had but little effect upon the flavor of the oil. Removing the bran from either soy beans or navy beans did not improve the flavor.

The general conclusion from the investigation is that "the soy cake meal furnishes a little better food than does the whole bean, and that it comes much nearer furnishing a substitute for meat than does the navy bean."

A bibliography of 65 titles is appended.

Blood dried by the Krause process, A. STRÖSE (*Ztschr. Fleisch u. Milchhyg., 29 (1918), Nos. 5, pp. 61–65; 6, pp. 70–77*).—The author reports an investigation of the possibilities of drying slaughterhouse blood to preserve it for human consumption.

It was found that fresh blood mixed with about 5 per cent of common salt and cooled before drying yielded, on evaporation by the Krause process (a centrifugal drying machine in which the material is sprayed in a fine stream against the walls of the container heated to 65 or 70° C. (149 to 158° F.)), a powder of excellent keeping qualities, and which on dissolving in water resembled fresh blood very closely in physical and chemical properties. A few food preparations in which the dried blood can be used are described.

Acquisition and utilisation of blood with particular reference to the drying process of Krause, F. OPEL (*Ztschr. Fleisch. u. Milchhyg., 29 (1919), Nos. 11, pp. 141–147; 12, pp. 156–163; 13, pp. 169–178*).—This article contains a compilation of material on the physiology, composition, and nutritive value of blood, a description of slaughterhouse methods, with statistics of slaughterhouse blood available in Germany, methods for the preservation of blood, and a detailed discussion of the Krause method of drying blood noted in the above article, with suggestions for the establishment of the process on a commercial scale.

Studies of mold in bread, W. Herter and A. Fornet (*Centbl. Bakt.* [*etc.*], *2. Abt.*, *49* (*1919*), *No. 7–9, pp. 148–173, pls. 2, figs. 13*).—Eleven species of mold were found to develop spontaneously on bread as follows (arranged in order of their frequency): *Aspergillus glaucus, Rhizopus nigricans, Penicillium crustaceum, Oospora variabilis, P. olivaceum, A. fumigatus, A. niger, A. flavus, A. nidulans, A. candidus*, and *Mucor pusillus*. These molds are described and illustrated, and the cause of their appearance on bread, the effect of their growth upon the composition of the bread, and the means which should be taken to prevent their appearance, are discussed.

Gluten in Italian pastes, A. Cutolo (*Bol. Soc. Nat. Napoli, 2. ser., 10* (*1917*), *pp. 130–169*).—This article contains a brief outline of the process of manufacture of Italian food pastes, analyses of various types of pastes, and the report of experimental studies on the changes taking place in the gluten of the flour in the manufacture of the paste.

The conclusion is drawn that enzym action on the gluten during the different processes, particularly drying, produces a change in the gluten, not rendering it soluble but lowering its agglutinating property. The presence of a certain amount of extractable gluten is thought to be an index of the quality of the paste. The nearer the amount approaches that of the total nitrogen the better is the quality of the paste from an organoleptic, commercial, and gastronomic point of view.

Some of the newer proprietary foods, J. P. Street (*Mod. Hosp., 13* (*1919*), *No. 3, pp. 244–246*).—Analyses are reported from the Connecticut State Experiment Station of some of the newer proprietary foods. These include 81 diabetic foods, 43 cereal breakfast foods, 4 Brosia meals, 6 coffee substitutes, 4 fig preparations, 2 infant foods, 7 milk preparations, 4 egg substitutes, 3 jelly and junket powders, 4 vegetable extracts, 5 chocolates and cocoas, and 11 miscellaneous foods.

The household foam test for butter and oleomargarin, H. H. Sommer (*Jour. Dairy Sci., 2* (*1919*), *No. 2, pp. 142–144*).—The household foam test for distinguishing between butter and oleomargarin and renovated butter is explained on the assumption that fats will foam if the water that they contain is held finely divided in suspension, and will sputter if the water gathers in droplets. The curd in butter is finely divided and holds small particles of water in suspension, while that in oleomargarin and renovated butter is coarse and allows the water to gather in droplets.

It is pointed out that certain butter substitutes, such as Troco, that contain finely divided substances capable of holding water, may foam as well as butter.

A comparison between the antiscorbutic properties of fresh, heated, and dried cow's milk, R. E. Barnes and E. M. Hume (*Lancet* [*London*], *1919, II, No. 8, pp. 323, 324*).—This is a brief report of an investigation of the relative antiscorbutic properties of fresh, dried, and scalded milk as determined by quantitative feeding experiments with guinea pigs and with monkeys.

The results obtained with raw milk confirm those of the earlier study of Chick, Hume, and Skelton previously noted (E. S. R., 40, p. 272). With guinea pigs, from 100 to 150 cc. of raw milk was found necessary to prevent scurvy in animals weighing from 300 to 500 gm. The same amounts of dried milk proved inadequate, every animal developing scurvy in from 20 to 30 days. Even with dried milk of quite recent manufacture it was found impossible to protect guinea pigs from scurvy with any amounts that could be fed. In the case of monkeys a daily ration of from 125 to 175 cc. raw milk proved adequate, while an amount of dried milk equivalent to from 250 to 300 cc. was found necessary to prevent scurvy.

Milk scalded by being brought rapidly to the boiling point in a saucepan over a gas burner and then immediately set to cool was found to possess an antiscorbutic value much in excess of dried milk, a rapid cure resulting from the substitution of 200 cc. of this scalded milk for an equivalent amount of the dried milk ration which had caused scurvy in a monkey.

Some evidence was also obtained indicating that winter milk is inferior to summer milk in antiscorbutic properties, corresponding to the differences in the cow's diet at these different seasons. In this connection the suggestion is made that the value of winter milk in this respect might be raised if swedes were employed for winter feeding in place of mangolds.

No significant differences were detected in the growth-promoting properties of raw and dried milk.

The antiscorbutic value of some Indian dried fruits, H. Chick, E. M. Hume, and R. F. Skelton (*Lancet [London], 1919, II, No. 8, pp. 322, 323*).—Dry tamarind, cocum, and mango were found to possess a definite, but small antiscorbutic value when tested in the usual way. "This value is greatly inferior to that of raw cabbages, swedes, germinated pulses, orange juice, lemon juice, but equal or superior to that of carrots, beet roots, cooked potatoes, raw meat juice, reckoned weight for weight in the natural condition."

The antiscorbutic and growth-promoting value of canned vegetables, M. E. D. Campbell and H. Chick (*Lancet [London], 1919, II, No. 8, pp. 320–323*).—This paper presents the results of a quantitative study of changes taking place in the nutritive value of vegetables during the process of canning, with special reference to the vitamin content. The experiments consisted essentially in estimating and comparing the minimal amounts of the vegetables studied (cabbage and green runner beans) when raw and after canning, which must be added daily to a basal scurvy-producing diet in order to protect young guinea pigs from scurvy over a period of three months. The vegetables were washed in cold water, blanched, cold dipped, and packed into lacquered cans, which were then nearly filled with boiling water, hermetically sealed and sterilized by exposure to steam at 100° C. for one and one-half hours in the case of cabbage, and on two successive days, for a total period of two and one-half hours in the case of the beans. The cabbage was tested two weeks, and the beans three months after canning. The results obtained are summarized in a table, in which data obtained with other foodstuffs are included for purposes of comparison. The conclusions drawn from this study are summarized as follows:

"In the process of canning vegetables the greater part of the original antiscurvy value of the raw vegetables is destroyed. In the case of runner bean pods the loss is estimated at about 90 per cent of the original value; in the case of cabbage at about 70 per cent of the original value . . . This loss is primarily due to the destruction of antiscurvy material occurring during the heating involved in the process of canning. A further loss may be expected to take place during the period of storage . . . In the case of the green-leaf vegetables which posssess, in addition to the antiscurvy vitamin, the 'fat-soluble' growth-promoting accessory factor, the latter substance is also lacking in the canned material unless the liquor be also taken."

A study of the microorganisms found in merchantable canned foods, E. W. Cheyney (*Jour. Med. Research, 40 (1919), No. 2, pp. 177–197*).—To determine whether in apparently tight cans of merchantable foods organisms persist through the sterilizing processes as at present carried out, 725 cans of merchantable foods in prime condition, including the usual market brands of meat, fish, vegetables, and fruits, were examined for bacteria, molds, and yeasts. Before analysis each can was incubated at 37° C. for at least 10 days. In opening and examining the cans special precautions were taken to exclude outside contamination during the examination, and particular media were used to insure the growth of any organism that might be present in the sample.

Living microorganisms were found in 58 cans, or 8 per cent of the total number. Some foods were always found sterile and some with a constantly low percentage, and others with a high percentage of cans containing viable organisms. Vegetables were either sterile or showed only a small number of cans containing viable organisms (8 per cent), fruits showed a consistently lower number (3 per cent), and fish and meat varied from 10 to 20 per cent.

"The organisms isolated constitute a sharply limited group of resistant spore-bearers, including the *Bacillus subtilis mesentericus* group, the related thermophiles, an anaerobe, four common species each of Aspergillus and Penicillium, and two border-line yeasts. No pathogenic organisms were found. The bacteria were associated chiefly with the meats, while the molds formed the sole flora of all the fruit cans found to contain living organisms. Thermophiles were found only in crab and lobster. There was evidence to suggest that in certain foods bacteria and molds had persisted through the processing, and that the usual methods of processing must be increased to obtain actual sterility in these foods."

Note on soluble lead in the glaze of casseroles, H. Masters (*Analyst, 44 (1919), No. 518, pp. 164, 165*).—Experiments made with several types of earthenware casseroles of French make, glazed only on the inside, showed that in some cases a considerable amount of lead can be extracted from the glaze, not only by the action of 4 per cent acetic acid but also by the action of dilute solutions of organic acids (1 per cent acetic, citric, or malic acid), such as might be used in ordinary cooking processes.

The lead extracted on boiling with 1 per cent citric acid for 30 minutes amounted in several cases to from 2 to 4 mg. of lead monoxid per square decimeter of the glaze. Data are given showing that the soluble lead is not completely extracted by the first treatment, the glaze continuing to yield lead even after 10 or 12 treatments.

Glazed earthenware of English make was found to yield an appreciable amount of lead, although less than the French casseroles.

Problems of food and our economic policy, H. E. Armstrong (*Jour. Roy. Soc. Arts, 67 (1919), Nos. 3485, pp. 653–662, figs. 3; 3486, pp. 667–676, figs. 2; 3487, pp. 681–692*).—The three Cantor lectures, given before the Royal Society of Arts (England), contain a brief outline of several of the most fundamental considerations which must be taken into account in order to understand the complex problems of nutrition, followed by a discussion of the more important of these problems. Particular attention is paid to hormones, enzyms, "functional adjuvants," and "advitants." According to the author's classification the term hormone should be applied "to the large class of chemically neutral substances, including nitrous oxid, alcohol and its congeners, the ethers, chloroform, etc., which act primarily as mechanical disturbing agents and in virtue of their irresistible penetrative power, not selectively and functionally." Enzym is used in the usual sense. The term "functional adjuvant" is applied to the internal secretions, and "advitant" to food accessories or vitamins.

In conclusion the author emphasizes the necessity of infusing into the medical profession and the public some elementary understanding of the principles of sound scientific dietetics. A revison of economic policy in the light of the growing knowledge of dietetic requirements is advocated, to increase the production and consumption of fresh fruits and vegetables and of clean milk of higher quality than that commonly sold.

The danger is noted of the tendency to regard food practically as fuel, and the importance is pointed out, particularly in the case of children, of the use of a varied dietary containing a large proportion of protein food with an abundance of "advitants."

Maintenance ration.—Minimum need of sugar and of fat, H. Bierry (*Compt. Rend. Acad. Sci. [Paris], 169 (1919), No. 4, pp. 197–200*).—This has been essentially noted from another source (E. S. R., 41, p. 468).

The effect of certain aluminum compounds on the metabolism of man, C. L. A. Schmidt and D. R. Hoagland (*Univ. Cal. Pubs. Path., 2 (1919), No. 20, pp. 215–244*).—This publication contains a discussion and tabulation of the data of the metabolism experiments conducted under the direction of A. E. Taylor as a part of the investigation by the Referee Board of Consulting Experts, U. S. Department of Agriculture, for the purpose of determining the effect of aluminum compounds on the health and nutrition of man. The general conclusions of the board have been previously noted (E. S. R., 31, p. 556).

Within the limits of error of the experiment all of the aluminum ingested was eliminated in the feces. The nitrogen elimination was not affected by the ingestion of aluminum compounds, but the phosphorus metabolism was noticeably altered, there being a distinct increase in the phosphorus eliminated in the feces and a corresponding decrease in the amount eliminated in the urine. With a normal diet only a small percentage of the total phosphorus intake was rendered unavailable, but in special subjects, on a diet of low phosphorus content, a large percentage of the phosphorus became insoluble by combination with the aluminum.

The effect of various acids on the digestion of proteins by pepsin, J. H. Northrop (*Jour. Gen. Physiol., 1 (1919), No. 6, pp. 607–612*).—The rate of pepsin digestion of gelatin, egg albumin, edestin, blood albumin, and casein in the presence of hydrochloric, nitric, acetic, sulphuric, oxalic, phosphoric, and citric acids at equal H-ion concentrations, as studied by amino nitrogen determinations with the Van Slyke method, was found to be the same for all acids with the exception of acetic acid, which diminished the rate of digestion of all proteins except gelatin.

The state of aggregation of the protein and the viscosity of the solution appeared to exert no marked influence on the rate of digestion, nor was there any evidence of antagonistic salt action in the effect of the different acids on the protein.

Involution of the thymus in birds, R. McCarrison (*Indian Jour. Med. Research, 6 (1919), No. 4, pp. 557–559, pls. 2*).—Observations of the thymus in both healthy and diseased pigeons are reported and summarized as follows:

The organ is twice as large in the male as in the female, indicating that it may possess some relationship to the sex glands. Starvation and deprivation of water-soluble B causes the thymus to undergo extreme atrophy out of all proportion to the loss of body weight, or to the atrophy of other organs, with the exception of the sex glands and spleen. The artificial feeding of rice bran, which contains a high proportion of water-soluble B, does not stay the atrophy of the thymus due to inanition. The thymus atrophies very rapidly also during septicemic invasion. Excessive feeding with mixed grains and butter causes no increase in the thymus.

The conclusion is drawn that "in so far as pigeons are concerned, the involution of the thymus is dependent on factors other than the maturation of the sexual function; these factors are mainly nutritional."

Certain nutritional disorders of children associated with a putrefactive intestinal flora, L. Porter, G. B. Morris, and K. F. Meyer (*Amer. Jour. Diseases Children, 18 (1919), No. 4, pp. 254–268, figs. 3*).—Case reports are given and discussed of certain types of alimentary intoxication occurring in children and attributed to the action of protein-splitting bacteria. The bacteriological methods employed by the author in identifying the intestinal flora in these cases are outlined, and methods of treatment and feeding described. The facts so far derived from the authors' observations are summarized as follows:

"Children whose diet is well balanced and whose nutrition is normal have an intestinal flora consisting of fermentative and putrefactive types without preponderance of either. Children fed on large quantities of cow's milk have a more complex flora made up of various types, most of which are facultative putrefactors. In children who suffer from certain of the types of alimentary intoxication with malnutrition, the intestinal flora departs in a uniform manner from the normal, and this departure is always characterized by the establishment of bacterial types predominantly putrefactive. The return of these children to normal health is coincident with a regression of the intestinal flora toward predominantly fermentative types and a later swing to balance between the two types. Such changes in the intestinal flora can be brought about in the intestine of the human infant by withdrawing animal protein and persistently feeding large amounts of lactose (from 2 to 4 oz. daily), and other carbohydrates (the period which may be necessary to produce this variation being from 10 to 40 days) . . . The progressive cessation of the symptoms of intoxication and a return of toxemic patients to nutritional health coincides with the recognizable dominance of a fermentative flora. Lactose and dextrins are the carbohydrates most effective in encouraging the rapid establishment of a fermentative flora in the intestines of infants and children."

Attention is called to the work of Torrey (E. S. R., 40, p. 867) as amplifying and reinforcing these conclusions.

The pathogenesis of deficiency disease.—II, The effects of deprivation of 'B' accessory food factors, R. McCarrison (*Indian Jour. Med. Research, 6 (1919), No. 4, pp. 550–556, pls. 3*).—In continuation of the investigation previously noted (E. S. R., 41, p. 264), this paper reports the clinical and morbid anatomical effects on pigeons of a dietary of autoclaved rice to which butter and onions had been added, and which was thus considered to be deficient in water-soluble B and proteins but to contain an excess of starch and an abundance of fat-soluble A and water-soluble C (antiscorbutic factor).

A preliminary study was made of the effects on healthy pigeons of adding butter and onions to the ordinary dietary of mixed grains. Marked differences in the weights of the different organs resulted as follows: The thymus underwent no change; an increase was noted in the spleen, ovary, liver, pancreas, stomach, heart, testicles, thyroid, and kidneys in the order mentioned; and there was a decrease in the weight of the adrenals, brain, and pituitary. Attention is called to the fact that the last named organs undergo enlargement under conditions of vitaminic deficiency, and thus appear to be very sensitive to food influences.

Pigeons on a diet of autoclaved milled rice, butter (to the extent of one-twelfth of an ounce per bird), and finely chopped onions developed avian beriberi very rapidly. The general appearance of these birds after death was very similar to that found in birds fed exclusively on autoclaved rice, with the exception that edema was almost invariably absent. The changes in size of the various organs were practically the same as those reported in the earlier study of the autoclaved rice dietary.

The author concludes that two food factors appear to be concerned in the production of avian beriberi (1) the so-called antineuritis factor, and (2) an antiedema factor. The latter appears to exist in unmilled rice as well as in butter or onions, or both.

The action of radium emanation on the vitamins of yeast, K. SUGIURA and S. R. BENEDICT (*Jour. Biol. Chem., 39 (1919), No. 3, pp. 421–433, fig. 1*).—A brief review is given of some of the more characteristic experimental results obtained by various authors in investigations of the influence of radium emanation upon chemical reactions, animals, plants, and enzyms. This is followed by the report of a study of the action of radium emanation on the vitamins of yeast as determined by feeding experiments with young rats, in which untreated and radium-treated yeast served as the sole source of water-soluble vitamin.

The minimum amount of yeast preparation needed in order to make a complete diet when added to an artificial diet was first determined. Two per cent of yeast content in the artificial diet was found to be sufficient to promote normal growth in young albino rats. The same amount of yeast exposed to radium emanation proved insufficient as shown by a very much smaller gain in weight. The conclusion is therefore drawn that "growth-promoting factors in yeast may be inactivated partially by means of exposure to radium emanation. It is possible that the therapeutic effect of radium upon neoplasms may be due in part, at least, to this destruction of growth-promoting substance."

Biometric standards for energy requirements in human nutrition, J. A. HARRIS and F. G. BENEDICT (*Sci. Mo., 8 (1919), No. 5, pp. 385–402, figs. 8*).—This has been essentially noted from another source (E. S. R., 41, p. 760).

The energy loss of young women during the muscular activity of light household work, F. G. BENEDICT and A. JOHNSON (*Proc. Amer. Phil. Soc., 58 (1919), No. 1, pp. 89–96*).—The energy study reported was conducted on groups of from 15 to 25 young women in a large respiration chamber particularly constructed for group work. The chamber, which is described in detail in the publication previously noted (E. S. R., 42, p. 62), has proved entirely practicable when used in periods of not over 20 minutes.

In the present research the standard values used for comparison were not obtained under the usual experimental conditions for determining basal metabolism but, to give practical living conditions, were determined 2 hours after a very light breakfast with the subjects sitting quietly reading. From a series of experiments on 12 different days, with over 200 women participating in 23 periods, the average heat production per kilogram per hour was found to be 1.12 calories.

The percentage increments in the metabolism due to the various household activities studied, arranged in order of increment in energy requirement, are shown in the following table:

Percentage increase in metabolism of women due to light muscular activity.

Occupation.	Number of women.	Number of experiments.	Number of periods.	Increment.	
				Range in individual experiments.	Average.
				Per cent.	*Per cent.*
Reading aloud	23–25	3	8	1–5	3
Standing quietly	20	1	1	9	9
Humming	15	2	2	10–16	13
Singing	14–20	3	4	16–34	22
Dusting	15–19	3	4	121–156	134
Sweeping	15	2	4	139–161	150

In addition to the muscular activities included in this table, an average increase of 0.32 calorie per movement per individual was obtained for the activity of standing up and sitting down, and for walking slowly an increase of 1.24 calories per kilogram per hour over a standard value of 1.20 calories.

The caloric requirements of normal infants and children from birth to puberty, F. B. Talbot (*Amer. Jour. Diseases Children, 18 (1919), No. 4, pp. 229–237, figs. 6*).—This article consists primarily of charts illustrating the hypothetical effect of diminished food supply, diarrhea, fever, and excessive muscular activity upon the growth of infants, as based upon the results obtained in a series of studies at the Nutrition Laboratory of the Carnegie Institution on the energy metabolism of normal infants and children from birth to puberty. A chart is included of the actual average basal metabolism for 24 hours of boys and girls from birth to puberty in which the calories are plotted against age. This shows that "there is no difference between the basal metabolism of boys and girls up to about one year of age, or about 10 kg. of weight, after which there is a sex differentiation, boys of the same weight having a somewhat higher metabolism than girls of the same weight until they reach 34 kg. of body weight, when the metabolism of both sexes is the same, after which the basal metabolism of girls is somewhat higher than that of boys."

ANIMAL PRODUCTION.

[Improvement of pasture], W. Somerville (*Nature [London], 104 (1919), No. 2617, pp. 421–425*).—An abridged account of the opening address of the president of the agricultural section of the British Association for the Advancement of Science, noted editorially in this issue (p. 106).

Cottonseed meal, F. D. Fuller and G. S. Fraps (*Texas Sta. Bul. 241 (1919), pp. 4–23*).—This bulletin reviews the efforts of the station's feed control service to maintain a high protein standard for cottonseed products sold in Texas as meal or cake, and gives an account of the agitation on the part of some cottonseed crushers in favor of reducing the protein minimum from 43 to 36 per cent. The authors hold that the higher standard is not only advantageous to feeders but it is to the best interest of the manufacturers as well.

Purebred live stock of the United States (*Washington: U. S. Dept. Agr., 1919, Spanish ed., pp. 63, figs. 53*).—This publication is elaborately illustrated with halftones of representative breeding animals, including horses, beef cattle, dairy cattle, hogs, and sheep. A series of maps of the United States show the distribution by counties of Poland China, Duroc-Jersey, Hampshire, Berkshire, Chester White, Shorthorn, Hereford, Aberdeen Angus, Jersey, and Holstein Friesian breeders, respectively. The text explains the importance of the live-stock industry in the United States, the measures taken against tuberculosis and other diseases, the Department of Agriculture's inspection of export animals, and similar matters. A list of breed registry associations is appended.

Purebred live stock of the United States (*Washington: U. S. Dept. Agr., 1919, Portuguese ed., pp. 63, figs. 53*).—This contains the same illustrative material as the Spanish edition noted above, and essentially the same explanatory matter.

Beef production, H. J. Gramlich (*Nebraska Sta. Bul. 174 (1919), pp. 22, figs. 6*).—The results of a 130-day feeding trial begun November 22, 1917, with 5 lots of 10 steers each are reported. Three lots were used to compare ground and snapped corn with shelled corn, cottonseed cake (nut size) being the protein supplement and alfalfa hay the only roughage. In addition one lot was given no supplement and the fifth lot received corn in the form of silage only. The main results follow:

Comparison of variously prepared corn for fattening steers.

Lot number.	Preparation of corn.	Initial weight per head.	Average daily gain.	Feed per pound of gain.			Cost per pound of gain.	Selling value per pound.	Average dressed weight.	Pork produced per steer.
				Corn or silage.	Cotton seed cake.	Alfalfa hay.				
		Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Cents.*	*Cents.*	*Per ct.*	*Lbs.*
1	Shelled	836	2.77	6.54	....	4.24	21.6	14.50	60.7	38.9
2	.....do	838	2.56	6.47	0.67	4.50	23.8	14.50	57.2	42.6
3	Coarsely ground	832	2.87	6.15	.54	[1] 3.12	21.7	14.85	59.8	28.9
4	Snapped (108 days)	825	2.64	[2] 7.50	.79	3.08	18.8	14.50	59.3	37.4
5	Silage	830	2.20	23.66	1.73	.99	18.3	12.50	58.5	....

[1] Ground and fed mixed with grain.
[2] Including 1.34 lbs. shelled corn (fed last 22 days).

Shelled corn and corn for grinding was charged at 2.5 cts. a pound and snapped corn at 1.5 cts. The prices used for the other feeding stuffs were cottonseed meal $60, alfalfa hay $25, and silage $10 per ton. The grinding charge for corn was 4 cts. a bushel, and for alfalfa hay $3 a ton. The snapped corn used was of an inferior grade; it is claimed that it would have given 75 per cent of its weight in shelled corn. The silage was made from corn which yielded 5 bu. to the ton. The cottonseed cake was suspected of containing a high percentage of hulls, and was not as much relished as in previous experiments. The check lot (lot 2) did not thrive well at the beginning of the experiment.

From the results obtained it is concluded (1) that the addition of cottonseed cake to a corn and alfalfa ration was not justified at the prices used, (2) that grinding the corn and alfalfa was profitable, (3) that feeding snapped corn is not only a source of profit but utilizes the husks which would otherwise dry in the field and be wasted, and (4) that a heavy silage ration without corn grain produced less finish than the other rations tested but made more economical gains than the check ration.

Hardening peanut-fed hogs, L. B. BURK and P. V. EWING (*Texas Sta. Bul. 242 (1919), pp. 5–14*).—To study the quality of pork produced by peanut-fed hogs finished on corn and cottonseed meal, seven lots of Duroc-Jerseys averaging 115 lbs. per head were variously fed for different periods, all of which terminated February 20, 1918. Summaries of the treatment accorded the different lots, the feeding results, and the determinations made on the carcasses follow:

Influence of systems of peanut feeding on gains of hogs and quality of pork.

Plan of feeding.	Lot number.	Feeding period.	Average daily gain per head.	Feed per pound of gain.	Average dressed weight.	Hard carcasses.	Soft carcasses.	Average loss in curing.	Melting point.		Average readings of firmness test.[1]
									Back fat.	Leaf fat.	
		Days.	*Lbs.*	*Lbs.*	*Per cent.*			*Per cent.*	*°C.*	*°C.*	
Corn alone	1	80	0.91	4.8	78.8	8	....	5	34.2	41.0	2.6
Corn+cottonseed meal (6:1)	2	80	1.13	4.2	79.3	8	....	5	37.3	42.8	2.0
Peanuts alone	3	80	1.32	3.0	87.4	....	8	8	27.0	34.7	45.2
Peanuts first 40 days; corn+cottonseed meal (6:1) thereafter	4	60	1.45	4.1	81.3	5	2	5	33.4	40.1	5.9
	5	70	1.15	4.2	80.0	7	1	4	33.1	41.3	8.5
	6	70	1.27	3.8	80.6	6	2	5	33.1	39.9	8.5
	7	85	1.10	4.2	82.4	8	....	5	37.4	42.3	6.3

[1] Method explained in Texas Sta. Bul. 226 (E. S. R., 39, p. 673).

Lots 5 and 6 were intended to be duplicates. Charging peanuts at 5 cts. and the other feeds at 8 cts. a pound, and with the selling price of firm hogs 16.5 cts. and of soft hogs 14.5 cts. a pound, lot 2 was the most profitable ($7.87 per head) and lot 8 the least ($1.42).

A table is also given showing the influence of hardness of flesh, without regard to lot, on the changes in weight during curing and smoking of hams, shoulders, picnic shoulders, sweet pickle bellies and dry salt bellies. It was found that soft pork gains less in sweet pickle cure and shrinks more in dry salt cure than firm pork, but that the changes during the smoking process are little, if any, influenced by degree of hardness.

Field damaged wheat for poultry, R. H. WAITE (*Maryland Sta. Bul. 231 (1919), pp. 61–66*).—Two White Plymouth Rock yearlings and 2 White Leghorn hens in their third year fed badly damaged wheat of the 1919 harvest for 6 weeks in August and September gained slightly in weight, consumed 33.12 lbs. of wheat, and laid 22 eggs. Four similar hens fed 1918 wheat of good quality lost somewhat in weight, ate 31.72 lbs. of feed, and laid 17 eggs during the same period. The 1919 wheat had been damaged by excessive rainfall, was much discolored, slightly moldy, partly sprouted, and toward the end was infested with weevils. No harmful results of its use were noted.

The author estimates that Maryland poultry consume over 10 per cent of the State's wheat crop, and points out the economy of including any damaged grain in the rations of hens.

Hens v. pullets, R. R. HANNAS (*New Jersey Stas., Hints to Poultrymen, 8 (1919), No. 1, pp. 4*).—Data collected in the course of the Vineland (N. J.) egg laying and breeding contests are cited to show that a bird in her second year lays fewer eggs than in her pullet year, produces a smaller margin of profit, requires more feed for body maintenance, tends toward longer broody periods, and has a higher mortality rate. It is held that hens belong in the breeding and not in the laying flock.

Culling for eggs and market (*U. S. Dept. Agr., Dept. Circ. 18 (1919), pp. 8, figs. 3*).—A leaflet prepared for the use of boys' and girls' poultry clubs.

Management of growing chicks (*U. S. Dept. Agr., Dept. Circ. 17 (1919), pp. 5, figs. 2*).—A leaflet prepared for the use of boys' and girls' poultry clubs.

Preserving eggs (*U. S. Dept. Agr., Dept. Circ 15 (1919), pp. 8, figs. 12*).—A leaflet prepared for the use of boys' and girls' poultry clubs.

Indian hides and skins (*Bul. Imp. Inst. [So. Kensington], 16 (1918), No. 2, pp. 170–239*).—Statistics are presented and discussed of the live stock resources of India and of the export trade in raw and tanned cowhides, buffalo hides, calfskins, goatskins, sheepskins, and miscellaneous pelts. Notes on the Indian tanning industry, including war time changes, are also given.

DAIRY FARMING—DAIRYING.

Dairy farming in southeastern Pennsylvania, G. A. BILLINGS (*Pennsylvania Sta. Bul. 159 (1919), pp. 3–42, figs. 16*).—From the records of a farm management survey in Chester County, Pa. (E. S. R., 34, p. 592), carried on cooperately by the station and the U. S. Department of Agriculture in 1911, the author has selected the records of 50 dairy farms, from 80 to 160 acres in size and with a labor income of $750 or more, for a special study to determine how these successful medium-sized farms in a long-established dairy center conduct their business.

Of the total farm land 59 per cent was planted in crops, a proportion thought to be higher than in many other dairy regions along the Atlantic coast. Corn for grain occupied 19 per cent of the cultivated area, silage corn 5 per cent, and hay 44 per cent. About 20 per cent of the land was in pasture.

Real estate formed 78 per cent of the capital invested and live stock 17 per cent. On the few farms maintaining pure-bred cows the operating capital was considerably more than 27 per cent of the total capital. Many of the barns are of native stone, in whole or in part, and were constructed in an era of cheap labor and plentiful material, and thus at present values the farms appear overcapitalized. The typical eastern Pennsylvania barn is described, and some modifications which have proved practicable are indicated.

On an average there were 21.4 cows and 4.7 heifers and calves to a farm, and 3.45 crop acres and 1.36 acres of pasturage to a cow. "It has been said that the dairyman should keep a cow per crop acre, but when the farm, as a whole, is considered and the diversified interests which go with dairying to fully utilize the farm labor, it is doubtful if the extreme intensity of stocking is any more profitable than the system followed by these farmers." Most of the farms maintained about 100 chickens.

The 22 farms with silos had 37 per cent more land in crops than the other farms, 10 per cent more stock, a 19 per cent higher income per cow, and made more money on hay, hogs, and poultry, yet they purchased 47 per cent more feed and raised 20 per cent less live stock.

Of the receipts of the 50 farms 11.4 per cent came from hay, 17.1 per cent from other crops, and 48.7 per cent from market milk. Of the expenses 36.4 per cent went for labor, 20.3 per cent for feed, and 10.3 per cent for fertilizer. The gross income was $4,280 at the time of the survey and the labor income $1,761. High-producing cows and crop yields above the average seemed to be the two most important items determining a large labor income.

Because of the convenient arrangement of barns and stables, a long pasture season, and pasture of good quality, live stock was being taken care of with a minimum of labor. About 11 days of man labor and 2 of horse labor were required annually by each animal unit.

Notes on working schedules, rations, cropping systems, and distribution of farm operations are included.

Trend of the dairy-cattle industry in the United States and other countries, T. R. PIRTLE (*U. S. Dept. Agr., Dept. Circ. 7* (*1919*), *pp. 19, figs. 21*).—Charts are presented showing graphically the changes that have taken place since 1850 in the "cattle" and "cow" populations of the important dairy countries of the world as far as these are revealed by census and other official statistics.

A widespread tendency for dairy stock to replace beef and work animals is noted, particularly in countries dependent on imported feeding stuffs. Over long periods of times dairy cows have shown less fluctuation in numbers than total cattle, and have been much less affected by drought, wars, and similar conditions.

A study of the birth weight of calves, C. H. ECKLES (*Jour. Dairy Sci., 2* (*1919*), *No. 3, pp. 159–169, fig. 1*).—The author summarizes the birth weights of 433 calves born after a gestation period of 260 or more days in the dairy herd of the University of Missouri. The following table gives the averages by breeds:

Birth weights of calves by breeds.

Breed.	Number of calves.	Average weight.			Ratio of calf's weight to dam's.
		Males.	Females.	Both sexes.	
		Pounds.	*Pounds.*	*Pounds.*	
Jersey	196	58	53	55	6.5 : 100
Ayrshire	53	73	65	69	6.9 : 100
Dairy Shorthorn	30	74	73	73	6.0 : 100
Holstein	154	93	88	90	8.0 : 100

Calves produced at the first and second parturition of their dams were somewhat heavier than those produced by mature cows, but there was also some evidence that very old cows tended to produce small calves. The Holstein records in particular indicate that the smaller weights of the first calves of heifers are due to the small size of the dams and not to immaturity as such. Very light calves tended to have the shortest gestation and the heaviest calves the longest, but between these extremes there was no clear evidence of relationship between gestation and birth weight.

That plans of nutrition of the dam has no appreciable influence on the calf's weight was indicated by a comparison of the calves of 16 light-fed and 13 heavy-fed cows.

Appetite as a guide in feeding dairy calves, A. C. McCandlish (*Iowa Sta. Research Bul. 51 (1919), pp. 179–184*).—A Guernsey bull calf aged 70 days, an Ayrshire heifer 87 days old, and a Holstein heifer 30 days old were allowed free choice of several concentrates (in separate compartments of a self feeder) and alfalfa hay for two 30-day periods. They were also fed "what milk was thought to be suited to their needs," and had access to salt, charcoal, and water, the amounts taken being recorded. The average initial weight of the calves was 122 lbs. and the average final weight 241 lbs.

The amounts of the various feeding stuffs eaten are given in the following table:

Feeds consumed by three calves given free choice of grains and hay.

Period.	Whole milk.	Skim milk.	Corn.	Oats.	Hominy feed.	Gluten feed.	Wheat bran.	Linseed meal.	Alfalfa hay.	Nutritive ratio.
Days.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	
1–30	864	168	1.3	59.1	0.0	15.3	13.3	62.7	32.7	1:3.4
31–60	678	678	108.9	68.9	.3	1.9	17.3	75.6	91.9	1:3.5

It is pointed out the calves responded to an increased proportion of skim milk by consuming a greater proportion of concentrates low in protein. It is stated that a ration for these calves conforming to the modified Wolff-Lehmann standard would have a nutritive ratio of 1:4.3 in the first period and 1:4.4 in the second. The consumption of total digestible nutrients was above that called for by the feeding standard.

The corn was offered both shelled and cracked and the oats both whole and ground, but of the corn consumed only 0.3 lb. was cracked, and of the oats only 0.9 lb. was ground. Another manifestation of an aversion to ground grain was the small consumption of hominy feed.

Cow-testing associations in California, E. C. Voorhies (*California Sta. Bul. 314 (1919), pp. 157–193, figs. 10*).—Report is made of the activities of the 15 active cow-testing associations in California. There were 428 herds enrolled July 1, 1919, comprising 16,800 cows. A number of records, particularly of herds tested in successive years, are cited. An appendix gives suggested forms for the constitution and by-laws of cooperative cow-testing associations, a members' agreement, and contracts with a tester and a farm bureau.

The cost of milk production in New England, A. W. Gilbert (*Agr. of Mass., 1917, pt. 2, pp. 54–65*).—Data on cost of milk production in New England and particularly in Massachusetts are cited from the investigations of the Boston Chamber of Commerce (E. S. R., 39, p. 676) and briefly discussed.

The effect of corrosive sublimate when used as a preservative in composite samples, H. C. Jackson (*Jour. Dairy Sci., 2 (1919), No. 3, pp. 170–182*).—The Babcock tests of 10 duplicate composite samples of milk (10 cc. a day for 14 days) are compared with the average daily tests. One of the duplicates in each case was preserved with 0.5 gm. of mercuric chlorid and the other with 1.5 gm.

The largest deviation of the average of two tests of one of the duplicate composites from the corresponding daily average was 0.162 per cent. It is concluded that 0.5 gm. is sufficient to preserve the samples, but that 1.5 gm. does not interfere with the test.

Bacteriological results obtained in practice with vat pasteurization and with one of the final package methods, B. W. Hammer (*Iowa Sta. Bul. 190 (1919), pp. 150–158*).—The bacterial counts of 127 samples of vat pasteurized milk and of 124 samples of milk pasteurized in the bottle by immersion are tabulated, as well as the counts of the raw milk from which each pasteurized sample was derived. In general there were fewer high counts in the milk pasteurized with final package method than by the vat method.

A previous study of the final package method by the author has been noted (E. S. R., 40, p. 776).

The cellular test for pasteurized milk under practical conditions, W. D. Frost and G. D. Moore (*Jour. Dairy Sci., 2 (1919), No. 3, pp. 189–196*).—Frost's method (E. S. R., 34, p. 118) of identifying pasteurized milk by its appearance under the microscope when stained with methylene blue was applied to 260 routine milk samples analyzed in the laboratories of the Chicago Health Department during July, 1918. All of the 47 raw samples were correctly placed, although 11 showed indications of having been partially heated. Of the remaining samples reported by the inspectors as pasteurized, 14 with a high bacterial count (over 500,000) and 12 with a low count had the appearance of unpasteurized or incompletely pasteurized milk. Assuming no false statements by milk dealers and no mistakes on the part of inspectors and bacteriological analysts, the 12 discrepant observations indicate an experimental error of about 4 per cent.

Directions for making the test are included. Its simplicity and rapidity are emphasized.

Fly pupæ in bottled milk, W. A. Riley (*Jour. Dairy Sci., 2 (1919), No. 3, pp. 183–188, figs. 2*).—Several cases in Minneapolis of the occurrence in bottled milk of pupæ of flies of the genus Drosophila are reported. The pupæ are known to the local dairymen as hay-seeds. None of those examined were viable. It is suggested that eggs had been laid and larvæ and pupæ developed while the unclean empty bottles were in the hands of domestic consumers, and the inference is that the larvæ had been killed but not ejected from the bottle in the cleansing process at the dairy.

Suggestions for the marketing of cottage cheese, D. L. James (*U. S. Dept. Agr., Dept. Circ. 1 (1919), pp. 14, figs. 13*).—Several types of retail and wholesale packages for cottage cheese are illustrated and discussed. Display advertising, newspaper publicity, employment of demonstrators, and the attaching of order blanks to milk bottles are methods suggested for stimulating the demand for this product.

Studies on abnormal evaporated milk, B. W. Hammer (*Iowa Sta. Research Bul. 52 (1919), pp. 187–198*).—An organism, for which the name *Bacillus amarus* is proposed, was isolated from a can of evaporated milk having a bitter taste and an abnormal odor. Sterile evaporated milk inoculated with this bacillus developed the flavor and odor of the milk in the original can and after several months became entirely coagulated, the bacteria meanwhile disappearing almost entirely. The factory furnishing the original sample had experienced much trouble with this kind of coagulation and had remedied matters somewhat by greater care in sterilization.

The morphological, cultural, and biochemical characters of *B. amarus* are described.

Dairy statistical references, T. R. Pirtle (*Jour. Dairy Sci., 2 (1919), No. 3, pp. 197–207*).—The author lists a large number of publications containing statistics of dairying in the United States and foreign countries. Particular attention is given to official periodical reports of imports, exports, prices, etc.

VETERINARY MEDICINE.

Laboratory studies in tropical medicine, C. W. Daniels and H. B. Newham (*London: John Bale, Sons & Danielsson, Ltd., 1918, 4. ed., rev., pp. XV+560, pls. 8, figs. 174*).—A large part of this work deals with insects, arachnids, and helminths in their relation to disease.

Fevers in the Tropics, L. Rogers (*London: Henry Frowde and Hodder & Stoughton, 1919, 3. ed., pp. XII+404, pls. 10, figs. 90*).—Information upon the rôle of insects and arachnids in disease dissemination in the Tropics is included in the accounts here presented.

The Bengal veterinary manual, 1918 (*Calcutta: Govt., 1918, pp. IV+70*).—This manual contains the rules of the Bengal Civil Veterinary Department and of the Bengal Veterinary College, and the Glanders and Farcy Act and the rules thereunder.

Simple live stock remedies, A. D. Faville and E. H. Lehnert (*Wyoming Sta. Circ. 13 (1918), pp. 4*).—A brief popular account.

Dips and dipping, H. H. Green (*So. African Jour. Indus., 2 (1919), Nos. 6, pp. 549–557; 7, pp. 610–629; 8, pp. 759–768*).—In continuation of the article previously noted (E. S. R., 41, p. 286) the first of these papers deals with dipping tanks, cost of dipping, and local supplies of arsenite of soda; the second with eradication of sheep scab, dipping intervals, incidence of scab in the Union, sheep dipping tanks, cost of dipping against scab, and classes and composition of dip; and the third with comparison of cost of manufactured and homemade dips, carbolic dips and tar preparations, standards for comparison, arsenical sheep dips, tobacco dips and nicotin preparations, and eradication of keds.

The germicidal activity of the eucalyptus oils, I, R. Greig-Smith (*Proc. Linn. Soc. N. S. Wales, 44 (1919), pt. 1, pp. 72–92, fig. 1*).—Samples of crude eucalyptus oil were found to possess a varying bactericidal power which was proportional to, but not caused entirely by, the acidity of the oil. Refined oils were found to be much less active than the crude oils, the activity being traceable to dissolved ozone. The vapors of eucalyptus oil possessed decided bactericidal properties.

An experimental study of the action of chloramins, B. Fantus and M. I. Smith (*Jour. Pharmacol. and Expt. Ther., 14 (1919), No. 3, pp. 259–274*).—This paper reports a study of the action of chloramin-T, dichloramin-T, and p-toluene sulphonamin upon unicellular organisms and upon various animals. The results of the investigation are summarized as follows:

"Unicellular animals are promptly killed by very dilute solutions of soluble chloramins. The chloramins are powerful irritants, causing inflammatory edema of the subcutaneous tissue, and even necrosis of the overlying skin on hypodermic injection, inflammation of mucous membranes on local application, and vomiting on oral administration.

"Chloramin-T depresses the central nervous system in the order of brain, medulla, spinal cord. . . . On intravenous injection, chloramin-T produces pulmonary edema, probably due to the chlorin in the molecule, as sodium *p*-toluene sulphonamin given intravenously does not produce such effect. . . . The hemolytic power of chloramin-T is due chiefly to its alkalinity, as is shown by the fact that it is also displayed by chlorin-free sodium *p*-toluene sulphonamin. On the other hand, *p*-toluene sulphonamin, containing no dissociable alkali, is not hemolytic. Hemoglobin is changed to alkaline hematin by the first two bodies. Methemoglobin formation due to the chlorin in chloramin-T occurs; but merely to a slight degree, and was only demonstrable in the test tube. Dichloramin-T likewise is slowly hemolytic and slowly changes hemoglobin to methemoglobin in vitro."

Pharmacological action of cadmium, C. L. ALSBERG and E. W. SCHWARTZE (*Jour. Pharmacol. and Expt. Ther., 13 (1919), No. 5, pp. 504, 505*).—Acute toxicological and feeding experiments were performed by the authors, cadmium being given as the chlorid but calculated in terms of the metal. The results are said to confirm the conclusions of Marme reported in 1867, concerning which no detail was given.

Cadmium is a powerful emetic, 25 mg. usually producing emesis when fed to cats in 100 gm. of meat and 15 mg. when given in 100 cc. of filtered fish juice. Nephritis is produced by parenteral administration. For rats, rabbits, and cats, the intravenous lethal dose was low (2 to 3.5 mg. of the metal administered as chlorid). Coagulation of protein and necrosis occur at the site of subcutaneous injection. "The most evident pathological change, aside from the nephritis, was the blue testicle of the rat, seen both ante- and post-mortem. In cats the sinus was found beating after respiration had ceased. The lowest dose of cadmium consistently tolerated by the animals (cats) in our series was 20 mg. daily. No cumulative effects were noted with lower doses. Vomiting and loss of appetite affected the higher-dosed animals. With dilutions of 250 per million in the diet of growing rats the gain in weight was not accomplished. The appetite was also affected, but apparently not as much as the growth curve."

Pharmacological action of gossypol, C. L. ALSBERG and E. W. SCHWARTZE (*Jour. Pharmacol. and Expt. Ther., 13 (1919), No. 5, p. 504*).—"Gossypol 'acetate' was isolated from the ether extract of gasoline extracted cottonseed kernels, by the method of Carruth [E. S. R., 34, p. 381]. Though tasteless and insoluble, this substance produces irritation of the pleuro-peritoneum, gastrointestinal tract, and edema when injected in oily or in alkaline solution.

"A fall in blood pressure and sometimes a slowing of the heart is produced on intravenous injection of the sodium salt of gossypol. Cats and rabbits die of circulatory failure; respiration is usually unaffected. The most prominent phenomenon observed was the cardiac irregularity, presumably premature and delayed systoles, skipped beats, without any immediate reference to the injection, but more frequent toward the last. Heart block (2 to 1) [was] observed once. Four mg. are usually fatal to rats when injected intraperitoneally in oily solution.

"Deaths from this substance may be divided into the three usual classes: (1) Acute, in which the circulatory failure is the direct cause; (2) subacute, in which pulmonary edema ensues (this was observed in cats after intravenous injection of about 75 mg. per kilogram, death occurring from the second to fourth day; in rats dying about the second day pulmonary edema can be noted ante mortem by a red coryza of the nose, and post mortem by similar material in the trachea); (3) chronic, observed in rats, and evidenced by cachexia and inanition, occurred after administration by stomach tube of gossypol in oily solution. Oil may be found in the stomach of the rat (post-mortem) which had been placed there a week previous, the gossypol re-isolated therefrom."

Poisonous plants and means of combating them, W. C. Barnes (*Producer, 1* (*1919*), *No. 5, pp. 7–12, figs. 6*).

Ultraspectroscopic studies on blood serum (*Jour. Infect. Diseases, 26* (*1920*), *No. 1, pp. 1–15, figs. 9*).—Two papers are presented.

I. *The antagonistic action of salt in blood serum*, by T. Tadokoro (pp. 1–7).—By means of an ultraspectroscope a study was made of changes in the colloidal state of blood serum brought about by the antagonistic action of certain salts. The groups $CaCl_2$ and $NaCl$, $ZnSO$, and $CaCl_2$, and $ZnSO_4$ and $NaCl$ were found to be antagonistic in that the change in state of a colloidal serum produced by one salt was reversed by the other salt. Observing the changes under an ultramicroscope it was found that the dilute serum showed microns which had Brownian movement. If the serum was mixed with $ZnSO_4$ or $CaCl_2$ its particles formed aggregates and became heterogeneous and their movement stopped, but if this serum was then treated with $CaCl_2$ or $NaCl$ the aggregated particles became free and homogeneous as in the original serum. From these results the conclusion is drawn that " the antagonistic action of two salts on blood serum is caused by a reversal of the dispersion of the serum and of the change of the form and structure of particles."

II. *The difference in the colloidal state of normal and immune serum*, by T. Tadokoro and Y. Nakayama (pp. 8–15).—This paper reports a comparative study by the ultraspectroscopic method of the serums of different animals and of immune and normal serums of the same animals. It was found possible by suitable dilution to differentiate between the serums of the animals used (dog, guinea pig, rabbit, and horse) by means of the difference in the position of the absorption bands between the wave-lengths of 2,950 and 2,400 microns.

A comparison of normal and immune serums diluted with 0.9 per cent sodium chlorid solution indicated that in all cases the absorption band of immune serum is larger and longer than that of normal serum.

The rôle of blood platelets in natural immunity, P. Govaerts (*Compt. Rend. Soc. Biol.* [*Paris*], *82* (*1919*), *No. 23, pp. 927–929*).—Evidence is given to indicate that the blood platelets play a rôle similar to that of the phagocytes but that their action is more rapid, taking effect in the circulating blood while the phagocytes act only in the capillaries. The blood platelets are thought to constitute the first barrier to foreign bodies introduced into the circulation.

A contribution to the immunization process with reference to the phase and amount of the antigen, M. von Eisler (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig., 79* (*1917*), *No. 5, pp. 291–302*).—Experimental evidence is given indicating that the solubility and absorbability of the antigen are important factors in the immunization process. Antigens in easily assimilable form, such as tetanus toxin and heated bacterial emulsions, cause approximately as strong antibody production after a single injection as after several injections of the same amount of the antigen. With antigens of great molecular complexity, such as carbolized bacterial emulsions, several injections are required to produce appreciable results.

A quantitative relationship is thought to exist between the toxin and resulting antitoxin, and also between the antigen employed and agglutinins formed, although the amounts which in individual cases are necessary for establishing the same titer vary considerably.

Vaccination by injection of heated cowpox virus, M. Henseval (*Compt. Rend. Soc. Biol.* [*Paris*], *82* (*1919*), *No. 23, pp. 889–891*).—The author reviews the conflicting results which have been obtained by various investigators in immunizing man or animals by injections of heated cowpox virus, and presents data indicating that the success of such immunization depends upon the temperature to which the virus has been heated. Rabbits inoculated with cowpox virus heated to about 60° C., a temperature sufficient to destroy the microorganisms present in the virus, were rendered immune to the disease, but with the same virus heated to 70° immunity did not result. This is thought to indicate that immunity obtained by this method is due to an endo- or exo-toxin present in the vaccine, and which is easily destroyed by heat.

Studies in acid-fast bacteria, XI, XII, A. I. KENDALL, A. A. DAY, and A. W. WALKER (*Jour. Infect. Diseases, 26 (1920), No. 1, pp. 45–51, 77–84*).—In continuation of the studies on acid-fast bacteria previously noted (E. S. R., 33, p. 769), two papers are presented.

XI. *The metabolism of virulent human tubercle bacilli* (pp. 45–51).—For the purpose of determining in what way virulent tubercle bacilli differ from avirulent types, and whether there are gradations in virulence among acid-fast organisms of the tubercle bacillus group, a study was made of the nitrogen metabolism of two cultures of virulent human tubercle bacilli. The results obtained are summarized as follows:

"Parallel cultures of virulent human tubercle bacilli, grown under the same conditions in glycerol broth, develop with remarkably uniform luxuriance, and the chemical changes associated with this development are quantitatively and qualitatively very similar.

"The noteworthy chemical features are the production of a feebly acid reaction, together with a gradual decrease in ammonia, amino nitrogen, and total nitrogen in solution up to the point of maximum development of the culture. As the recessive changes, resulting presumably in autolysis of the bacilli, become dominant, a resolution of nitrogenous constituents becomes manifest. This proceeds until a very considerable return to conditions in the original quantitative nitrogenous composition of the culture medium is attained. The amino nitrogen, however, is somewhat greater than the original content, suggesting that the autolytic process yields considerable amounts of nitrogenous substance, which can be measured by the Sörensen method of formol titration.

"The contrast between the development of an acid reaction, on the one hand, and the minimal evidence of deamination (shown by the ammonia curve) and of action on the protein constituents of the medium (amino nitrogen production), on the other hand, suggests that glycerol may be utilized largely for the energy requirements of the bacilli, thus shielding the protein constituents from extensive breakdown. In other words, the glycerol appears to exert a sparing action for the protein constituents of the medium. This is in harmony with the generally accepted view that glycerol is a desirable, if not essential, constituent of medium suitable for the cultivation of the human types of the tubercle bacillus.

"It is in sharp contrast to the bovine types of tubercle bacilli, which do not appear to require the addition of glycerol as a constituent of mediums adapted to their cultivation."

XII. *The metabolism of bovine tubercle bacilli* (pp. 77–84).—In this study four cultures of bovine tubercle bacilli were used, two of which were very virulent and two slightly virulent, for rabbits.

"The three noteworthy features in the metabolism of the bovine tubercle bacilli herein studied—progressively alkaline reaction in glycerol mediums, increase in ammonia (or deamination), and parallel increase of amino acids—point definitely to two significant facts: First, that the character of the metabolism of these organisms, both virulent and avirulent, is distinctly proteolytic in glycerol broth, and, secondly, that glycerol does not appear to spare the protein constituents of the broth from bacterial breakdown. Glycerol, in other words, is not a source of energy for bovine tubercle bacilli. On the contrary, glycerol appears to be an important source of energy for human tubercle bacilli, and the marked differences between the metabolism curves of the human and bovine types, including the Smith reaction curves, appear to depend on this very definite and simple fact.

"The limited number of observations herein recorded do not, of course, permit of too great generalization on this point, but the chemical evidence, so far as it goes, taken into consideration with the reaction curves characteristic of the human and bovine types, are absolutely in harmony and appear to justify the conclusion that glycerol is a source of energy to human tubercle bacilli, but it is not a source of energy to bovine tubercle bacilli.

"The development of an acid reaction in glycerol cultures of human tubercle bacilli and the absence of chemical evidence of proteolysis indicate that the human type can ferment glycerol. The development of an alkaline reaction in glycerol cultures of bovine tubercle bacilli, together with the unmistakable increase of deamination and cleavage of protein to amino acids, indicates equally strongly that bovine tubercle bacilli can not or do not ferment glycerol. This appears to be the true explanation for the observed differences in reaction curves of the two types of organisms."

Experimental studies on equine piroplasmosis, P. J. du Toit (*Arch. Schiffs u. Tropen Hyg., 23 (1919), Nos. 7, pp. 121–135, figs. 5; 8, pp. 141–147, figs. 2*).—In attempted transmission of *Nuttallia equi* by the several stages of *Ixodes ricinus* the results were invariably negative. In experiments conducted there was no cross immunity between *N. equi* and *Piroplasma cabelli*.

The heredity of rabies (*Vet. Rev., 3 (1919), No. 4, p. 413*).—This is a review of three papers on the subject by P. Remlinger.

Complement fixation in diagnosis of tuberculosis, W. H. Moursund (*Jour. Infect. Diseases, 26 (1920), No. 1, pp. 85–92*).—The author reports a trial of the complement fixation test for the diagnosis of tuberculosis in 186 cases, 103 of which were active and 51 inactive cases of pulmonary tuberculosis, 1 was a case of tuberculosis of the epididymis, and 31 were nontuberculous cases. Of the active cases 10 gave positive sputum and positive complement fixation tests, 6 gave negative sputum and positive fixation tests, 41 gave positive sputum and negative fixation tests, and 46 gave negative sputum and negative fixation tests. Of the inactive cases 50 gave negative reactions and 1 a positive fixation test, and of the nontuberculous cases 29 gave negative reactions and 1 a positive fixation test.

The author concludes that the reaction is not specific and is of very little, if any, value as a diagnostic aid.

Complement fixation test for tuberculosis, J. S. Pritchard and C. E. Rodrick (*Jour. Amer. Med. Assoc., 73 (1919), No. 25, pp. 1879–1882*).—Observations on the use of the complement fixation test for the diagnosis of tuberculosis are reported.

Of the 466 cases studied, 233 were proved on final diagnosis to be tuberculous and the same number nontuberculous. The complement fixation reaction was positive in 69 per cent of the active moderately advanced cases and in 16 per cent of the cases not proved tuberculous. The authors conclude that the test, while not conclusive in itself, is of considerable help in differential diagnosis. A negative reaction in some advanced cases of pulmonary tuberculosis is explained on the ground that the cells have lost their power of reaction owing to their prolonged saturation with specific toxins.

Public health studies concerning cheese, E. C. Schroeder and G. W. Brett (*Ann. Rpt. Internatl. Assoc. Dairy and Milk Insp.*, *6* (*1917*), *pp. 190–204*).—During the course of a study of the frequency with which cheese is infected with tubercle bacilli 256 samples of several varieties were purchased from retail dealers in Washington, D. C. Of these, none of the 59 samples of Cheddar, 3 miscellaneous, and 32 Neufchatel were found to be infected, while 1 of the 31 samples of cottage and 18 of the 131 samples of cream cheese were found infected with tubercle bacilli of the bovine type.

"Guinea pigs were inoculated with portions of [artificially] infected cheese on the first, eighth, fifteenth, twenty-third, thirty-ninth, fiftieth, seventy-second, ninety-ninth, and one hundred and fourteenth days after it was made. The guinea pigs inoculated on all days from the first to the thirty-ninth, inclusive, developed generalized tuberculosis; those inoculated on and after the fiftieth day remained well, showing conclusively that the tubercle bacilli in the cheese had lost their virulence sometime between the thirty-ninth and fiftieth days."

The authors conclude that cheese as a whole so far as disease germs are concerned, with the possible exception of cream cheese, is a fairly safe article of food.

The development and histology of the cecum in the ox, J. A. Place (*Ann. Rpt. Mich. Acad. Sci.*, *20* (*1918*), *pp. 119–132*, *pls. 2*, *figs. 15*).—"The cecum of the calf first appears as an evagination on the distal end of the intestinal loop which extends into the umbilical cord. It is first seen in embryos of 21.3 mm. length and with the return of this loop into the body cavity it has no definite position till birth. The manner in which it develops indicates that it is a functional part of the alimentary canal, while a study of it in the adult shows conclusively that it serves as a reservoir for liquid which aids greatly in digestion and absorption.

"The histology of the cecal apex in the entire vertebrate kingdom reveals lymphoid tissue as its characteristic feature, and that of man is no exception. Hence histological and physiological evidence tend to show that the vermiform appendix is but a remnant of a retrograding cecum which was once of service and not an anatomical feature that appeared by chance."

The Federal quarantine and the rising cost of conducting cattle business in tick-infested area, E. M. Nighbert (*Fla. Grower*, *20* (*1919*), *No. 17*, *pp. 12*, *21*).

Cholera of the sheep (jaundice, yellows or yellowses, headgrit, or plocach), J. P. McGowan (*Lancet* [*London*], *1919*, *II*, *No. 10*, *pp. 426–429*).—This is preliminary account of studies of an epizootic disease affecting lambs during the months of August and September, in which the fatal cases live for a period varying from a few days up to a fortnight or three weeks. This disease, which occurs throughout Scotland, commences with diarrhea and in a few days the animals shrink markedly in size. The disease is characterized by great thirst.

"Jaundice and headgrit cases and cases with loss of ears are occurring at the same time, and these cases are affected with this same diarrhea. There is marked dryness of all the tissues of the body on post-mortem examination; the intestinal tract, however, is empty of food and is full of a large quantity of a greenish-yellow watery fluid, which can be detected during the life of the animal by its 'jumbling.' There is marked inflammation of the fourth stomach and duodenum. The fact of the whole of the lambs, apart from those obviously ailing, having received a bad check would seem to indicate that there were a large number of them suffering from the disease in a milder and not so noticeable form. It is a disease with a high mortality at times and can cause great financial loss to the owner."

The cause of the affection has not as yet been determined.

On the occurrence of Aleurobius farinæ in skin scrapings of horses, A. W. N. Pillers (*Vet. Rec., 32* (*1919*), *No. 1619, pp. 22, 23, pl. 1*).—A summary of information on *A. farinæ*, with a list of six references to the literature.

A study of the fecal examination of 1,000 imported dogs, M. Wigdor (*Jour. Amer. Vet. Med. Assoc., 56* (*1919*), *No. 2, pp. 189–191*).

Studies on anthelmintics.—V, The administration of oil of chenopodium in soft, or soluble elastic, gelatine capsules, as compared with other modes of administration, M. C. Hall and M. Wigdor (*Jour. Amer. Vet. Med. Assoc., 56* (*1919*), *No. 2, pp. 169–177*).—Continuing the studies previously noted (E. S. R., 41, p. 782), the authors find in experiments with dogs that the soft, or soluble elastic, capsules of chenopodium open in the stomach and not in the small intestine. This is sustained by the high ascaricidal efficacy of the soft capsules of chenopodium as well as by their efficacy against hookworms.

"The administration of purgatives at the same time as the soft capsules hastens the opening of the capsules. Without the purgatives, capsules lie in the stomach as long as 1 hour and 21 minutes, and apparently digest in 1 to 2 hours. With the purgatives, capsules are wholly or partly digested in 30 minutes. Without purgatives, chenopodium from the capsules may be detected in the intestines in 1 hour and 30 minutes. With purgatives, chenopodium may be detected in the intestines in 30 minutes."

A new nematode in fowls having a termite as an intermediary host (Filaria gallinarum n. sp.), A. Theiler (*Rpts. Dir. Vet. Research, Union So. Africa, 5–6* (*1918*), *pp. 695–707, fig. 1*).—The nematode *F. gallinarum*, here described as new, develops in a termite identified by Fuller as *Hodotermes pretoriensis*. Feeding experiments are reported in which adult nematodes were obtained from 9 of 10 birds which were fed upon infested termites. The morphology and biology of the parasite are dealt with.

Common poultry diseases (*U. S. Dept. Agr., Dept. Circ. 20* [*1919*], *pp. 7, figs. 2*).—A popular account, prepared for use in boys' and girls' poultry club work.

Lice, mites, and cleanliness (*U. S. Dept. Agr., Dept. Circ. 16* [*1919*], *pp. 8, fig. 1*).—A popular account, prepared for use in boys' and girls' poultry club work.

RURAL ENGINEERING.

Calculation of flow in open channels, I. E. Houk (*Miami* [*Ohio*] *Conserv. Dist., Tech. Rpts., pt. 4* (*1918*), *pp. 283, pls. 22, figs. 49*).—This report contains a broad discussion of the methods of calculating flow in open channels, particularly large natural channels, describes in detail the methods followed in making the numerous determinations of discharge required in the development of the Miami Valley flood protection project, and states in full the computed results of maximum rates of run-off during the 1913 flood. A large number of field experiments conducted for the purpose of testing and comparing velocity formulas are also reported. The following general conclusions are drawn:

"Of the German formulas which have been developed on the assumption that a roughness coefficient is not necessary, not one possesses sufficient merit to warrant its adoption as a general formula. It is not possible to develop a satisfactory formula for velocities in open channels without introducing therein a variable term to allow for changes in roughness. No exponential formula so far advanced could be recommended for general use. The effect of temperature should not be introduced into a formula for the flow of water in open channels unless its magnitude is greater than that assumed by Biel. Manning's formula in its original form is practically as good as Kutter's for channels of small or ordinary dimensions, but is inferior to Kutter's for large rivers. Although its algebraic form is somewhat more simple than Kutter's equation, it does not seem advisable to adopt it for use even in ordinary instances since the latter formula is now in quite general use and, moreover, is applicable to extreme cases. No definite effect of the slope on the Chezy coefficient is shown by the experimental data for small open channels. Data available at present show a decrease in C with an increase in S in large rivers with flat slopes. The Bazin formula is inferior to Kutter's for all types of open channels. The constancy of the factor *m* is less than that of the factor *n* in all instances. Although the Kutter formula is not ideal, it is the best equation available at the present time."

Theory of the hydraulic jump and backwater curves, S. M. Woodward (*Miami* [*Ohio*] *Conserv. Dist., Tech. Rpts., pt. 3* (*1917*), *pp. 1–59, figs. 36*).—Experiments on hydraulic jump and the backwater curve conducted in connection with the design of the flood control works of the Miami conservancy district are reported.

It was found that the hydraulic jump can occur only when the initial velocity is greater and the depth of flow correspondingly smaller than the values for critical flow. The jump takes places across the critical point so that the depth subsequent to the jump is greater than the critical value. The change in depth is definitely determined by the initial values of depth and velocity, and the depth subsequent to the jump is given by the equation

$$D_2 = -\frac{D_1}{2} + \sqrt{\frac{2V_1^2D_1}{g} + \frac{D_1^2}{4}}.$$

In this formula D_1 is the initial depth of the stream, V_1 the initial velocity, and g the acceleration due to gravity.

A hypothesis is given regarding the condition existing within the jump, which suffices to account for the possibility of its existence.

A backwater curve is defined as the curve taken by the surface of a stream of water in which all changes of velocity take place in accordance with Bernouilli's theorem. This includes the effect of ordinary friction where the retarding force produces a smoothly distributed and regular effect, but excludes cases of sudden impact such as exist in the hydraulic jump. Neutral depth of flow in a channel is defined as the depth at which the bottom slope is equal to the slope required to overcome friction. It is the depth, therefore, at which the depth and velocity may remain unchanged.

All the possible backwater curves for a wide rectangular channel are considered in detail. Twelve different cases are distinguished according to the relative magnitude of the critical depth, the neutral depth, and the actual depth. For each case the internal conditions are completely analyzed, and finally a typical backwater curve for each case is shown plotted accurately to scale by the use of Bresse's tables and some supplementary calculations. The application of backwater curves and the hydraulic jump to actual conditions is shown by two simple instances illustrating transition backwater curves and the necessary existence of the hydraulic jump to connect two backwater curves of different types.

The hydraulic jump as a means of dissipating energy, R. M. Riegel and J. C. Beebe (*Miami* [*Ohio*] *Conserv. Dist. Tech. Rpts., pt. 3* (*1917*), *pp. 60–111, pls. 13, figs. 27*).—Experiments conducted in connection with the design of storage discharge works in the Miami conservancy district are reported, the purpose of which was to devise a type of outlet structure, the discharge from which would be symmetrical and free from erosive velocities on the sides and bottom of the channel. The results were obtained from small scale models.

It was found that the hydraulic jump, when properly controlled, is a most convenient and practicable method of eliminating the energy of flowing water for large structures. "Its use is economical and safe, and, since it is governed by a known theoretic law, its position and magnitude are capable of fairly definite calculation.

"To secure a stable and uniform jump, the water entering it should be in the form of a sheet of uniform thickness and velocity across the channel. This condition can be secured in the channel below a conduit by providing a smooth and gradual expansion in the sides of the channel, so shaped as to insure continuous contact between the spreading water and the sides. The sides should be tangent to the conduit walls and should not be concave toward the water until the jump is passed. The bottom of the channel should be gradually depressed below the outlet, so that at the point where the jump is desired, there shall be sufficient depth of tail-water to produce it. Where the occurrence of the jump is desired through a wide range of discharge and tail-water conditions, the position of the jump can be confined within narrow limits by causing it to occur on a floor sloping downward from the conduit effect. . . . Concentration is prevented by the use of one or more sub-

"When more than one conduit discharges into the same outlet channel, a concentration of flow is produced at the junction of the spreading water from the conduits. Inequality in discharge from several conduits produces the same effect. . . . Concentration is prevented by the use of one or more submerged weirs below the jump, which baffle and distribute the concentrations. When the flow is equal in the several conduits, the submerged or baffling weir can not be below a certain minimum height, depending upon the degree of irregularity in flow above the jump, but weirs of varying height above this minimum are equally satisfactory. When the flow from the conduits is decidedly unequal, . . . a high weir becomes necessary, the most satisfactory height appearing to be about one-half the depth of the tail-water at maximum discharge. The addition of a second weir below, of equal or greater crest elevation, still further checks the tendency toward concentration.

"When a sufficient body of water is maintained above the weirs, both in depth and length, to insure the formation of a jump, the depth of the channel below the weirs depends only upon the mean velocity which may be allowed on the material of the channel bed. Roughening the floor of the channel above the jump increases the channel friction, diminishes the velocity, leaves less work for the jump to do, and increases its stability. The use of a baffle weir in the floor tends to cause the water to rise in the air in a sheet, eliminating the jump. This must be prevented by maintaining an adequate depth of tail-water over the weir."

Electric pumping with results of tests and operating records, H. W. Wagner (*Iowa Engin. Expt. Sta. Bul. 46* (*1917*), *pp. 80, figs. 17*).—This bulletin is limited to electric pumping as compared with engine pumping, and deals with equipment, operation, and economies of electrical pumping plants. It reports detailed data from tests and service records of different electrical pumping plants in the State of Iowa. Some of the more important conclusions are as follows:

"Practically all 'power pumps' designed to be driven by belt, gear, chain, or direct connection (high speed), are adaptable to operation by the electric motor. . . . The most commonly employed types of electrically driven surface pumps are the vertical cylinder, single-acting, plunger, triplex pump and the horizontal shaft, centrifugal pump. Double-acting piston pumps and rotary pumps are sometimes used. . . .

"When reliable electric current is available, it is gradually replacing other forms of power for pumping. . . . With reliable current, electric pumping results in general satisfaction because of the low investment in power machinery and because of the convenience and low cost of attendance. With undependable current or unsteady voltage, electric pumping causes dissatisfaction and possibly a return to steam pumping. . . .

"The same points should be considered when one is choosing power for pumping as when choosing type of pump—first cost, length of useful life, reliability, and total cost of operation. . . . Power plants are arranged in the following order as to first cost: Steam (high), oil, gasoline, electric motor (low). Steam pumps and pumping engines and electric motors are likely to have a longer useful life than oil and gasoline engines. . . .

"A careful study and analysis of the average problem indicates that with a reasonable rate for current, pumping by electricity results in a lower total of fixed charges and operating expenses than does pumping by any type of engine."

The influence of hydraulic works on Dutch agriculture (*Dept. Landb., Nijv. en Handel* [*Netherlands*], *Verslag. en Meded. Dir. Landb., No. 1* (*1917*), *pp. XVI+208, pl. 1*).—This is a rather extensive report on the drainage projects and other projects for the control of surface and soil water in Holland with reference to their influence on agriculture and agricultural conditions. It is pointed out that, with reference to their agricultural use, the soils of many of the lowland localities are in poor condition owing to lack of proper drainage. This is attributed to (1) poor condition of both large and small drainage ways, (2) increasing run-off due to decreased cultivation and increased land clearing, (3) high stage of the tidewater, (4) interference by watermills, and (5) a generally prevalent imperfect insight into the need of proper soil drainage. The conditions for each Province are discussed in detail.

Irrigation in Sind, T. F. MAIN (*Agr. Jour. India, 13* (*1918*), *No. 4, pp. 653–659*).—This article discusses irrigation conditions in Sind, and reports the results of an experiment on the irrigation of 50 acres of wheat with reference to methods affecting the economical use of irrigation water. The main feature of the treatment was the tillage before planting.

Surface water supply of New Mexico, 1888–1917, J. A. FRENCH (*Santa Fe, N. Mex.: State Engin. Dept., 1918, pp. 227*).—This is a compilation, from all available reliable sources, of monthly discharge records on all streams in New Mexico where they have been computed from 1888 to December 31, 1917.

Surface water supply of New Mexico, 1918, J. A. FRENCH (*Santa Fe, N. Mex.: State Engin. Dept., 1918, pp. 149*).—This report presents the results of measurements of flow made on streams in eight river basins in New Mexico during 1918.

Land clearing by explosives, C. W. BURROWS (*Dept. Agr. N. S. Wales, Farmers' Bul. 124* (*1919*), *pp. 30, figs. 15; also in Agr. Gaz. N. S. Wales, 30* (*1919*), *Nos. 3, pp. 153–167; 6, pp. 381–390, pls. 4, figs. 11*).—This article deals with the use of explosives for removing stumps and roots and for breaking bowlders. The use of gelignite is recommended for this purpose, as it is considered to be safer for the farmer to handle. It is a somewhat too high velocity explosive, however, and gives better results when slowed down mechanically.

Explosives for subsoiling, J. G. McDONALD (*Rhodesia Munitions and Resources Com. Rpt. 1916, pp. 10, 11*).—Data on methods and cost of subsoiling with dynamite in Rhodesia are given, it being stated that the total cost per acre of material and labor will vary from $6.82 for holes spaced 25 ft. apart laterally and longitudinally, to $39.46 for holes spaced 10 ft. apart.

Poisoning green timber with sodium arsenite, C. W. BURROWS (*Agr. Gaz. N. S. Wales, 29 (1918), No. 2, pp. 113, 114*).—Information on timber removal by poisoning with sodium arsenite is given. A useful strength for quick and effective work in all kinds of timber is as follows: Arsenic 1 lb., washing soda 1 lb. or caustic soda ½ lb., water 4 gal., and whiting ½ lb. The addition of this whiting is merely that it may serve as an indicator on trees treated. The time to carry out the work of poisoning is when the tree is dormant. The tree is frilled and the solution is poured into the frill clear around the tree.

The arrangement of farm fields, J. I. FALCONER (*Agr. Col. Ext. Bul.* [*Ohio State Univ.*], *15 (1919–20), No. 1, pp. 16, figs. 9*).—Popular information together with diagrams of field layouts are given.

The oil engine and its application to Indian agriculture, W. M. SCHUTTE (*Agr. Jour. India, 13 (1918), No. 4, pp. 608–615*).—Experimental data are briefly reported which indicate that for irrigation pumping in India the power pumping plant, when an oil engine is the prime mover, can be run much more economically than bullock-driven plants. Further experiments on sugar-cane crushing "have proved conclusively that even the small power plant is a great improvement on the country-made bullock mill."

Other advantages of engine power are discussed.

Kerosene as a fuel for farm tractors, J. A. SECOR (*Trans. Amer. Soc. Agr. Engin., 12 (1918), pp. 171–187*).—This is a summary of data from several sources from which it is concluded that, from the strictly commercial viewpoint, the oil tractor has surpassed the gasoline and steam tractors.

"The fact that kerosene is practically nonvolatile at atmospheric temperature is advantageous rather than detrimental to its use as a fuel for the farm tractor. Experience with various methods of regulating the speed and power of farm tractors demonstrates that quantity governing has practical advantages over existing methods of regulation.

"The only feasible method of using kerosene in an engine when controlling factors of combustion are variables is to readjust the temperature of the combustion chamber and the fuel to air ratio of the fuel mixture to suit each new set of conditions caused by each change in compression. In order for the quality, quantity, and combustion temperature of the fuel mixtures to be automatically readjusted in coordination under a varying load, these readjustments must be subject to a common unitary control; therefore, ordinary functions of the speed-controlling governor should be increased so as to include such triple automatic coordinate control. The addition of water to the fuel mixture in automatically varying quantities under governor control is the most efficient means for regulating internal temperatures at the higher loads."

The tractor as an investment, J. B. DAVIDSON (*Iowa Agr., 20 (1919), No. 6, pp. 213, 214, 240, fig. 1*).—The author reviews his tractor experience in general, and is of the opinion that the success of a tractor depends largely upon (1) work of a nature adapted to its use, (2) sufficient number of days' work a year to reduce appreciably the cost of the overhead charges per day, (3) proper lubrication at all times, (4) skill on the part of the operator to detect trouble at all times, (5) knowledge of how to inspect the tractor, (6) ability to make the necessary adjustments, and (7) provision in the way of proper implements.

Draft tests of farm machinery, E. J. STIRNIMAN (*Trans. Amer. Soc. Agr. Engin., 12 (1918), pp. 9–25*).—Draft tests at Iowa State College of a full disk harrow, a spader disk harrow, a cutaway disk harrow, a spike tooth harrow, a culti-packer land roller, a corrugated land roller, a grain drill, a corn harvester, a potato digger, and a manure spreader are reported.

The disk tests were conducted on oats and corn stubble fields, the soil being a black, sandy loam, and on alfalfa sod. It was found that the full disk required less draft per foot of width than the spader disk when doing the same quality of work on an oat stubble field. This was shown more conclusively by comparing the tests of the disks when set at the same angle, 18°. The spader disk, although weighing 8 lbs. less per foot, required 0.156 more horsepower per foot of width to operate it. This was also shown by comparing the data when the gangs were set at their maximum angles. The full disk set at an angle of 20° 30′, required 0.476 h. p. per foot of width, while the spader disk set at a smaller angle (15° 30′) required 0.664 h. p. The draft required per foot of width for both disks when set straight (no angle) was approximately the same for the given field conditions. The draft per foot of width of the double cutaway disk on old alfalfa sod, fall plowed, was not much greater than that of the full single disk, and the work done by the double disk was more satisfactory.

Only one make of spike tooth harrow was tested, and a comparison was made between single and double harrowing on corn stubble, fall plowed, 6 to 7 in. deep, in black, sandy loam. The maximum average horsepower was 3.633 when pulling the four sections hitched in pairs with pairs in tandem, with the teeth adjusted at their maximum angle of 90°. With the same hitch, but with the angle of teeth set at 37° the average horsepower was 3.2. The average maximum horsepower when pulling one pair of sections with the teeth set at their maximum angle of 90° was 2.295, but with the same hitch with the angles of teeth changed to 37° the average horsepower was 1.338. The average maximum horsepower required to pull the second pair of harrows over the same ground covered by the first pair was 1.338. The difference in draft between the first and second harrowing was considerably less when the teeth were set at an angle of 37°. In this case the draft for the four sections was 3.2 and, the draft for the two sections being 1.685 each, this gives a difference of 0.17 for the second pair of harrows; whereas for the test of the maximum angle of teeth the difference was 0.953. The average maximum draft for single harrowing was 2.295 h. p. or 0.191 h. p. per foot of width; whereas the draft for the second harrowing was 1.338 h. p. or 0.111 h. p. per foot of width. The average draft for single harrowing when teeth were set at an angle of 37° was 1.685 h. p., or 0.14 h. p. per foot of width, while the draft required for the second harrowing was 1.515 h. p., or 0.125 h. p. per foot of width.

The roller tests were conducted on a level wheat field, recently seeded, in black, sandy loam soil. The average horsepower required for the culti-packer was 1.527 at an average speed of 1.818 miles per hour, and for the corrugated roller, 1.723 h. p. at an average speed of 2.001 miles per hour.

The grain drill tests were conducted on a level, well compacted seed bed in black, sandy loam soil. The maximum horsepower required was 1.23 when drilling 2 bu. per acre, 2½ in. deep, at a speed of 2.253 miles per hour. The maximum horsepower required with the machine in gear but with the furrow openers out of the ground was 0.515.

The corn harvester test was conducted in firm, dry soil, free from weeds. The corn was frosted and dry and the stand was poor. The test run in the heaviest stand of corn gave the maximum horsepower requirement. At this place in the field a bundle was collected approximately every 20 ft.; whereas, in four other tests a bundle was collected within a range of 29 to 40 ft. The average of the tests was 2.5 h. p., which is considered a fair average for any field with conditions such as enumerated. The maximum draft (863 lbs.) was obtained just as the bundle was kicked out, and was more than double the average maximum draft (400 lbs.). The draft varied from less than 180 lbs. when not cutting to above 800 lbs. when cutting and discharging a bundle.

The potato digger tests were conducted in black, sandy loam soil from which the crop had been removed. The maximum power requirements when in full operation varied from 5.01 to 6.68 h. p., and the maximum power requirement when in gear but out of the ground and run on firm soil was 1.13 h. p.

The manure spreader test was run on a comparatively level oat stubble field, the surface of which was wet and slightly sticky. The power requirements when spreading wet straw manure were greater than when spreading dry yard manure. The maximum horsepower required when unloading dry manure was 3.7 h. p., and was obtained when unloading at the rate of 11 loads per acre.

The following table summarizes the maximum power requirements of the different machines under different conditions:

Maximum horsepower for machines tested.

Kind of machine.	Size.	Weight.		Conditions of work.	Kind of field.	Maximum horsepower.	Speed per hour.
		Machine.	Load.				
		Lbs.	*Lbs.*				*Miles.*
Full disk harrow	10 ft	710	215	1½–2″ deep, maximum angle.	Oat stubble	4.86	3.23
Do	do	710	215	2–3″ deep, maximum angle.	Corn stubble	3.82	2.87
Do	do	710	170	4½–5″ deep, maximum angle.	Corn stubble, fall plowed.	4.32	2.16
Do	do	710	170	3½–4″ deep, maximum angle.	Alfalfa sod	4.26	1.96
Spader disk harrow	do	680	215	1½–2″ deep, maximum angle.	Oat stubble	6.72	3.49
Do	do	680	215	2–3″ deep, maximum angle.	Corn stubble	6.75	3.38
Cutaway disk harrow.	2 sec., 6′–6″.	540	165	4½–5″ deep, maximum angle.	Corn stubble, plowed.	2.99	1.60
Do	do	540	165	3–4″ deep, maximum angle.	Alfalfa sod	3.64	1.93
Grain drill (single disk).	7–12 ft	830	0	2 bu. per acre, 2–2½″ deep.	Potato	1.23	2.25
Potato digger (elevator type).		1,040	0	7–10″ deep, no potatoes.	do	9.30	2.23
Spike tooth harrow.	4–6′ section	548		Double harrowing (maximum angle).	Fall plowed corn stubble.	3.80	1.87
Do	2–6′ section	548		Single harrowing (maximum angle).	do	2.31	1.95
Culti-packer roller	2–7′ section	1,040	145	Crushing and packing.	Winter wheat	2.70	2.98
Corrugated roller	1–8′ section	1,210	145	do	do	1.85	2.00
Corn binder		1,420	165	do	Corn field	3.06	2.87
Manure spreader	C	1,980	1,900	Maximum rate 18 loads per acre, manure, wet straw.	Oat stubble	4.75	2.64
Do	C	1,980	3,340	11 loads per acre, yard manure.	do	3.81	2.32

Equalizers and hitches, E. A. White (*Trans. Amer. Soc. Agr. Engin., 12 (1918), pp. 124–135, figs. 11*).—The author gives mathematical and graphical analyses of different equalizers and hitches for farm machinery, the purpose being to present "a method by which equalizers and hitches may be analyzed, thereby affording a means of making fundamental comparisons and when desired predicting the results which may be expected in a given case."

Rural structures of reinforced concrete, A. Fanti (*Costruzioni Rurali in Cemento Armato. Milan: Ulrico Hoepli, 1917, 2. ed., pp. XV+316, figs. 160*).—This is a handbook of information on the design and construction of rural structures of reinforced concrete in Italy, including silos, buildings, wine and oil factories, roads, bridges, canals, dams, reservoirs, etc. The use of concrete blocks is also dealt with, particularly for the construction of houses and other farm buildings. General information is included on concrete proportioning and mixing and on plain and reinforced concrete design.

Notes on grain pressures in storage bins, W. J. Larkin, Jr. (*U. S. Dept. Agr. Bul. 789 (1919), pp. 16, pl. 1, fig. 1*).—This bulletin gives tabular data commonly used in design by grain elevator engineers, together with rules for the more advantageous use of the tables and graphical charts which are intended to further facilitate the designing of grain bins. The discussion is based on Janssen's formula, which is as follows:

$$V=\frac{D\times W}{4\times k\times \mu'}\left(1-\frac{1}{\frac{4\times k\times \mu' H}{eD}}\right)$$

$$L=kV$$

In this formula, V=vertical pressure of grain at depth H in pounds per square foot, D=diameter of bin or diameter of inscribed circle in feet, W=weight of grain in pounds per cubic foot, $k=\frac{L}{V}$=ratio of lateral to vertical pressure, μ'=coefficient of friction of grain on bin walls, H=height in feet of grain above point in question, e=base of Naperian logarithms, and L=lateral pressure of grain at depth H in pounds per square foot.

Considerable practical design data and information, based on experiments and actual cases, are given. A selected list of references on the pressure of stored grain is included.

Capacity of silos and weights of silage, C. H. Eckles, O. E. Reed, and J. B. Fitch (*Kansas Sta. Bul. 222 (1919), pp. 22, figs. 2*).—This bulletin presents substantially the same data as Bulletin 164 of the Missouri Experiment Station (E. S. R., 41, p. 691).

Silo construction, C. M. Evans (*Tex. Agr. Col. Ext. Serv. Bul. B-49 (1919), pp. 19, figs. 16*).—This bulletin outlines the essential and desirable features of silos with special reference to Texas conditions.

A handy lick-trough for sheep, L. Judd (*Agr. Gaz. N. S. Wales, 30 (1919), No. 8, pp. 551–553, figs. 5*).—Detailed drawings of two lick-troughs for sheep are given.

Poultry houses (*U. S. Dept. Agr., Dept. Circ. 19 (1919), pp. 8, figs. 9*).—Brief popular instructions for the planning and construction of poultry houses are given.

Brood coops and appliances (*U. S. Dept. Agr., Dept. Circ. 13 [1919], pp. 8, figs. 6*).—Various coops and appliances are described and illustrated and information given regarding their use.

Poultry appliances and methods, R. H. Waite (*Maryland Sta. Bul. 230 (1919), pp. 47–62, figs. 29*).—This bulletin describes and illustrates several appliances and methods for simplifying poultry work developed at the station.

A hot-water circulation system of heating brooders, J. Hadlington (*Agr. Gaz. N. S. Wales, 29 (1918), No. 5, pp. 331–337, figs. 9*).—Plans showing the design of the brooder house, brooders, and hot-water system in use at the Hawkesbury Agricultural College are given.

Water on the farm, F. B. Guthrie (*Agr. Gaz. N. S. Wales, 28 (1917), Nos. 11, pp. 761–766; 12, pp. 837–841; 29 (1918), Nos. 2, pp. 77–81; 3, pp. 153–157; 4, pp. 229–234; 5, pp. 305–310; 6, pp. 381–386; 8, pp. 572–574; also in Dept. Agr.*

N. S. Wales, Farmers' Bul. 121 (1918), pp. 42).—This article deals with farm water supplies for human consumption and household purposes, irrigation, watering stock, and use in steam boilers, taking up particularly methods of clarification and chemical and bacteriological purification.

A new process of sewage purification: Oxidation of sewage without a bacterial bed, E. Rolants (*Rev. Hyg. et Police Sanit., 41 (1919), No. 5, pp. 459–478*).—This is a review of the results of works by others on the purification of sewage by aeration in the presence of activated sludge.

Activated sludge experiments at Sheffield: Successful results by agitation, J. Haworth (*Munic. Engin. and Sanit. Rec., 63 (1919), No. 1523, p. 228, fig. 1*).—Experiments on the purification of sewage by aeration in the presence of activated sludge showed that by so regulating the revolutions of the agitating paddle as to obtain thorough intermixing of the activated sludge with the sewage and to produce constant change of surface of the liquid, purification could be obtained satisfactorily to the extent of at least three fillings of the tank per day without the use of the aerator. It is concluded that under such conditions the necessary air required to maintain biological activity may be obtained by surface aeration. This was confirmed by service tests.

Insect life on sewage filters, W. H. Parkinson (*Munic. Engin. and Sanit. Rec., 63 (1919), Nos. 1522, pp. 66, 67; 1523, pp. 82, 83; 1524, p. 96; 1525, p. 112; 1526, p. 128; 1527, pp. 144, 145; 1528, p. 160; 1529, p. 176; 1530, p. 192; 1531, p. 210; 1533, p. 242; 1534, p. 258; 1535, p. 274*).—This series of articles describes the results of prolonged investigations on the functions of insect life in sewage filters.

It was found that such insects have an intimate connection with the process of sewage purification in that they destroy the colloidal matter which constitutes such a common cause of ponding. Sewage filters upon which the insect *Achorutes viaticus* were introduced were enabled to purify an increased volume of sewage per unit area, while labor costs for cleaning the surface or renewing the material were reduced to a minimum.

Fire prevention on the farm and elsewhere (*Toronto: Ontario Fire Prevention League, 1919, pp. 32, figs. 19*).—This pamphlet contains several articles on or related to the prevention of fires on farms and in farm buildings.

RURAL ECONOMICS.

Cost of producing some Missouri farm crops, O. R. Johnson and R. M. Green (*Missouri Sta. Bul. 165 (1919), pp. 3–26, figs. 10*).—This bulletin is intended to give a condensed statement of crop production costs as determined up to the present time, following a preliminary report previously noted (E. S. R., 33, p. 292). The following table summarizes the data relating to average costs of the crops studied:

Average cost of production for various crops, 1910–1917, inclusive.

Crop.	Cost.			Net receipts.
	Per acre.	Per bushel.	Per ton.	Per 10 hours' labor.
Corn in crib at farm	$15.98	$0.57	....	$2.26
Oats in bin at farm	11.11	.42	....	1.17
Wheat in sack at farm	13.31	1.06	....	2.33
Rye at farm	10.67	.82	....	4.05
Clover hay, loose and in stack	7.22	....	$8.11	4.48
Timothy hay, loose and in stack	6.71	....	6.79	7.59
Alfalfa hay, loose and in stack	19.80	....	9.34	4.92
Soy beans	14.28	2.30	....	....
Cowpea hay	13.53	....	9.66	....

An average of the labor records of 52 Missouri farms that kept strict account of the labor used, and for what it was used, shows that only 29.58 per cent of the man labor was on crops; 33.66 per cent on stock, and the remainder, or 36.76 per cent, on miscellaneous work much of which brought no direct returns but was necessary to the operation of the farm.

What cotton must bring, J. S. WANNAMAKER (*Banker-Farmer, 6 (1919), No. 12, pp. 2–5, figs. 4*).—Evils such as low-paid labor of negro and poor white women and children, wretched living conditions, and soil depletion which have resulted from false economic conditions of cotton production are presented here in an argument for the continued high prices for cotton. The necessity of increased production in spite of high economic cost is urged, and some solutions of problems connected with handling and marketing cotton are described.

A Government grain monopoly, E. VON BECHTOLSHEIM (*Ein Reichsgetreidemonopol. Munich: Max Steinebach, 1918, pp. 87*).—The author discusses the source and character of Germany's foreign and domestic grain supply, war-time methods of controlling distribution of it, the organization of a grain trade monopoly, and methods of determining a fair price under Government control. The arguments presented are that profits from handling the grain supply are too insignificant to warrant a Government grain trade monopoly, and that the price to the consumer would be increased if the Government attempted to increase its revenue by such a plan. It is held that Government control of milling operations would yield greater profits.

Assurance of the food supply by means of supply contracts, G. G. ZITZEN (*Fühling's Landw. Ztg., 66 (1917), No. 5–6, pp. 116–123*).—The author discusses the disadvantages to farmers and dwellers in the city of ignorance of the demand and supply of agricutural food products, gives examples of the mutual benefit derived from a few specialized contract arrangements for war supplies of food and other commodities, and urges the necessity of some comprehensive system of supply contracts in the future adjustment of acreages cultivated and needs of the city population in Germany.

The economic situation in Europe, H. C. HOOVER (*Jour. Bd. Agr.* [*London*], *26 (1919), No. 6, pp. 580–584*).—Passages from a memorandum prepared for special purposes, indicating the author's analysis of the shortage of raw materials and the world need for immediate increased production, are published here. The points are made that attempts to control prices can only result in further curtailment of the total commodities available for the total number of human beings to be fed, clothed, and housed, and that all attempts at international control of prices, with a view to benefit the population in Europe at the cost of the producer elsewhere, will produce retrogression in production abroad.

[The economic position of the United Kingdom in regard to foodstuffs: 1912–1918], W. A. PATON (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Misc. Ser., No. 96 (1919), pp. 12–29, 154–156*).—This chapter is an analysis of statistics of trade, production and consumption of cereals, meats and dairy products, sugars, fruits and vegetables, and other foodstuffs taken principally from the annual (and monthly) statements of trade of the United Kingdom.

It is shown that the production of grain, legumes, and potatoes increased in this period, but that even the present stimulated rate of production is not sufficient to make Great Britain self-sufficing or to change her position in the food trade of the world. It is also shown that the accompanying decline in the production of fodder crops will tend to reduce the domestic production of meats and dairy products. Detailed tables are given in appendixes.

Arable v. grass under the present conditions of agriculture, D. KELLY (*Jour. Farmers' Club* [*London*], *1919, Nov., pp. 95–111*).—In this paper it is maintained that the arable area in England must be increased or at least not allowed to go back to that of the period before the war, and that means of guarantying this are a revision of the hours of labor, the use of the tractor, and other labor-saving machinery, cheapening of artificial manures, relief from local taxation, and bureaucratic control and interference with agriculture, and the development of agricultural education and research.

The discussion centers chiefly about the difficulties with hours and wages for agricultural labor.

The worker's share in agriculture, H. REW (*Jour. Bd. Agr.* [*London*], *26* (*1919*), *No. 6, pp. 584–591*).—An address briefly defining profit sharing and copartnership and urging fairer understanding between farmer and laborer.

Scottish farm labor, J. F. DUNCAN (*Scot. Jour. Agr., 2* (*1919*), *No. 4, pp. 498–507*).—The author describes the evils of the long contract and tied house as factors in the unrest of Scottish farm workers, and urges shorter hours and improved housing conditions.

How the Government works with the farmer, D. F. HOUSTON (*Amer. Rev. of Reviews, 60* (*1919*), *No. 5, pp. 502–507*).—Prices to farmers, land available for settlement, growth of population, and increase of farm ownership are the general topics discussed here. The organization and activities of the U. S. Department of Agriculture relative to the Federal Reserve Act, personal credit to farmers, improvement of marketing and distribution, including the market news service, highway development, proposed Federal feed and fertilizer legislation, and the food production program for 1920, are briefly described.

List of organizations pertaining to agriculture in New York State (*N. Y. Dept. Farms and Markets, Div. Agr. Bul. 117* (*1919*), *pp. 130*).—This includes lists of State, county, and national organizations, and classified lists.

The public land system of Texas, 1823–1910, R. MCKITRICK (*Bul. Univ. Wis., No. 905* (*1918*), *pp. 172, figs. 2*).—The introduction to this monograph briefly compares land systems of the United States, Spain, and Texas, and land laws which were enacted for the purpose of transferring public lands to private owners. Part I relates to the formation of the public domain of Texas, including accounts of Spanish and Mexican colonization and the independence and annexation of Texas. Part II is devoted to the subject of the legislative disposition of the public domain of Texas. Chapters are included on land grants to settlers, land grants to internal improvement companies, public lands as a source of revenue, land grants for educational and eleemosynary institutions, and the public land question in Texas, which last chapter covers general characteristics of State legislation relating to public lands and social aspects of the problem.

The conclusions are reached that the State has not made the best possible use of this domain, notably as to developing mineral land and timber, the reafforestation of cut-over lands, the protection of the agricultural population against the acquiring and holding of farm land by nonresident owners, and the organization and regulation of industrial and commercial corporations. The author maintains that the relationship between landlord and tenant is one of the most acute economic problems in Texas politics, and more acute in Texas than in any other State in the Union.

Additional detailed information is given in appendixes, and a bibliography relating to historical, economic, and legislative aspects of land tenure is included.

Rules and regulations of the Secretary of Agriculture under the food products inspection law of July 24, 1919 (*U. S. Dept. Agr., Off. Sec. Circ. 144* (*1919*), *pp. 10*).—This gives the text of the rules and regulations under the provision enabling the Secretary of Agriculture "to investigate and certify to shippers and other interested parties the quality and conditions of fruit, vegetables, poultry, butter, hay, and other perishable farm products."

The church in rural America, G. A. BRICKER (*Cincinnati: Standard Pub. Co., 1919, pp. 193, figs. 24*).—The author discusses and illustrates the relationships of the church and country life, especially functions of ministers and deaconesses as rural leaders, debts of city dwellers to country churches, the relationship of religion and agriculture, the survey and its application, and various ways of organizing rural religious forces.

Monthly Crop Reporter (*U. S. Dept. Agr., Mo. Crop Rptr., 5 (1919), No. 11, pp. 109–120*).—In this number are included the usual monthly estimates of acreage and production, data as to farm and market prices for various agricultural products, and the United States crop summary for November, 1919, together with several brief articles, notes, and tabular data as to special crops. Among the latter is an estimate of the causes and extent of the yearly average damage to corn in the United States, 1909–1918.

History of prices during the war (*War Indus. Bd.* [*U. S.*], *Price Buls., 1919, Nos. 2, pp. XIII+395, figs. 22; 4, pp. 19, figs. 17; 8, pp. 21, figs. 3; 9, pp. 22, figs. 6; 10, pp. 19, figs. 6; 11, pp. 23, figs. 5; 12, pp. 17, figs. 5; 13, pp. 23, figs. 3; 14, pp. 18, figs. 5; 15, pp. 16, figs. 4; 16, pp. 15, figs. 4; 17, pp. 12, figs. 2; 18, pp. 18, figs. 4; 19, pp. 20, figs. 3; 20, pp. 44, figs. 17; 21, pp. 35, figs. 9; 23, pp. 57, figs. 29; 24, pp. 53, figs. 19; 25, pp. 49, figs. 12; 26, pp. 49, figs. 8; 30, pp. 35, figs. 11; 31, pp. 25, figs. 4; 32, pp. 29, figs. 8*).—The numbers noted here of the series of price bulletins pertain respectively to international price comparisons; prices of foods; feed and forage; wheat and wheat products; corn and corn products; oats, rice, buckwheat, and their products; barley, hops, rye, and their products; sugar and related products; vegetables and truck; edible vegetable oils; fruits, nuts, and wine; spices and condiments; tea, coffee, and cocoa; tobacco and tobacco products; live stock, meats, and fats; poultry and dairy products; cotton and cotton products; wool and wool products; silk and silk products; hides and skins and their products; rubber and rubber products; paper; and fibers and fiber products.

The aim of these studies is to show war-time price fluctuations of the different commodities in the light of data relating to production, imports, exports, stocks, Government purchase and Government control, and other factors especially influencing the markets.

Wholesale prices [of agricultural products] in Canada, 1916 and 1917 (*Canada Dept. Labor, Ann. Rpt. Wholesale Prices Canada, 7 (1916), pp. 1–64, 112–161, 198–288, figs. 22; 8 (1917), pp. 1–37, 47–71, 87–156, figs. 15*).—These pages continue information previously noted (E. S. R., 36, p. 593).

It is indicated that prices moved steeply upward during the first part of 1917 and less steeply thereafter. The index number at the end of the year, 257.1, had more than doubled since 1910, when it was 124.2.

Agricultural statistics in the Netherlands (*Dept. Landb., Nijv. en Handel* [*Netherlands*], *Verslag. en Meded. Dir. Landb., No. 3 (1919), pp. LXXX+109, fig. 1*).—This report continues information previously noted (E. R. S., 40, p. 894).

Crops and prices in Tunisia, H. N. COOKINGHAM (*U. S. Dept. Com., Com. Rpts., No. 276 (1919), pp. 1100–1103*).—Notes published here relate chiefly to olives, wine, fruit, vegetables, and cereals. Information is also given relating to the scarcity of fish and milk, acreages and prices of the 1920 tobacco crop, and a few proposals for exploiting products of forest and field.

AGRICULTURAL EDUCATION.

The significance of type activities in agricultural education, T. H. Eaton (*School and Soc., 10 (1919), No. 257, pp. 632–636*).—In this discussion of the significance of type activities as a means of teaching agriculture, the author assumes that "all education is specific modification of the individual through specific activities; specific modifications serve to adjustment to a new situation only so far as that new situation overlaps in generic elements the situation by reaction to which modification was accomplished . . . the specific situations which constitute the subject matter of education for the occupation of farming are not even objectively identical with those which the prospective farmer must meet."

The author states that from the point of view of the educator the significant development in a factory system moving toward standardization of processes and products lies in the stabilization of environmental factors. In the occupation of agriculture, which may be viewed as a complex of skills and would seem to be susceptible to analysis into coordinate units, the weather, growth and maturity, disease and other enemies, to say nothing of market, transportation, and labor variations, such as are not wholly controlled even yet in our most efficient manufacturing industries, enter to upset order and arrangement and to interject wholly new elements. Attention is called to minor skill complexes in the occupation of farming wherein the objective situations are relatively stable and comparable to those in mechanical occupations, and to enterprises of farm life wherein the completeness of control of environmental factors approaches that under a factory system. While in a factory the chief requirement, from the point of view of a manager, is to place each man in a fixed niche in which his activities bring the largest returns, the problem of the farmer is to find for himself and his employees, not the job in which each is most proficient, but the job that for each will best repay effort on any given day or hour of the day. Hence, the emphasis in the education of the farm worker must be upon adaptiveness rather than adaptation. He concludes that, by carefully selected typical enterprises of large scope in plant husbandry, animal husbandry, farm engineering, and farm management, it is reasonable to hope that much can be accomplished in providing experience that will function in the productive enterprises of farm life, if not in perfect adaptation at least sufficiently for a worth while adaptiveness. Education for the job seems here to turn back to education for the worker, the saving concept in any lasting scheme of vocational education.

General suggestions of the State Board of Control for vocational agricultural education (*[Little Rock], Ark.: State Bd. Control Vocat. Bd., 1919, pp. 53*).—This contains plans for vocational agricultural education and an analysis of the Smith-Hughes and the Arkansas Vocational Acts. One-year survey courses in soils and field and garden crops, in animal husbandry, dairying, and poultry husbandry, in horticulture and farm forestry, and in farm management and agricultural engineering; suggested lists of laboratory and shop equipment and of literature for the vocational agricultural schools; a list of suitable projects for the four years' work of agricultural departments and high schools; suggestions for shop work; suggested activities to be carried out by vocational agricultural teachers during the summer; and forms for blanks and reports are included.

Vocational education (*Cal. State Bd. Ed. Bul. 23 (1919), pp. 47*).—The general regulations of the State Board of Education for the establishment and maintenance of Federal and State aided vocational education in California for 1919–20 are outlined.

State Board for Vocational Education: Statement of plans and policies (*Bul. Ky. Dept. Ed., 12 (1919), No. 3, pp. 55*).—This bulletin contains (1) a synopsis of the Smith-Hughes Act; (2) the text of the Kentucky enabling act; and (3) a statement of the revised plans and policies for the school year beginning July 1, 1919. The University of Kentucky is designated as the teacher-training institution for white teachers and the Kentucky Normal and Industrial Institute at Frankfort for colored teachers. Outlines of the 4-year teacher-training courses in vocational agriculture and home economics for white and colored students, 4-year and 2-year courses in vocational agriculture and 4-year courses and part-time courses in vocational home economics are appended. A plan for itinerant teacher training in agriculture is included.

Plans for vocational education in Minnesota (*St. Paul, Minn.: Dept. Ed., 1919, pp. 105*).—This is a statement of the plans for the administration and supervision of vocational education in Minnesota for 1919–20.

Of the available teacher-training fund, 35 per cent is to be devoted to agriculture and 30 per cent to home economics. The College of Agriculture of the University of Minnesota is designated for the training of teachers of agriculture. The length of the course is 4 years or 144 unit hours, plus 144 hours of practical experience or contact with farming on a useful and productive basis in addition to the 2 years of practical experience required for admission. Observation work and teaching experience are acquired in the University High School, the School of Agriculture, and high-school departments of agriculture in the various towns of the State. A plan for the training of agricultural teachers in service is included.

The university is designated for the training of teachers of home economics subjects. The length of the course is 4 years or 186 hours. Two, 3, and 4 year type courses in vocational agriculture, type courses and suggested 2 and 4 year courses in vocational home economics, a 4-year course for the preparation of teachers of vocational agriculture with a brief description of subjects, a 4-year course for the training of teachers of vocational home economics, a 2-weeks' intensive training course for vocational agricultural instructors, given in the summer of 1919, with description of subjects, and proposed summer session teacher-training courses in home economics are outlined.

Plans for vocational education, 1919–20 (*Helena, Mont.: Dept. Pub. Instr., 1919, pp. 44*).—This contains a statement of the plans for the administration of vocational education in Montana for 1919–20.

Of the total available teacher-training fund not less than 30 nor more than 50 per cent is to be devoted to agriculture, and not less than 30 nor more than 45 per cent to home economics. The teacher-training course in agriculture extends over four years and consists of 141 hours in required agriculture and science, of which not less than 97 hours will be in agriculture, and with a total of 222 hours. A 2-year course for graduates of liberal arts colleges, consisting of 94 hours in required agriculture and 23 in education, will also be offered. Each student in vocational agriculture will be required to do 12 weeks of observation and 24 weeks of practice teaching. A proposed plan for itinerant teacher training in agriculture is included.

Teacher training in home economics will be given at the Montana college and the State university. The course will be four years in length, consisting of home economics subjects 25 to 30 per cent, related subjects 20 to 25 per cent, and education 10 to 15 per cent. Observation and practice teaching has been provided.

A 4-year teacher-training course in agriculture and a proposed curriculum for the preparation of teachers of home economics in the college are outlined.

Plans for vocational education in Nebraska (*State Bd. Vocat. Ed. Nebr., Bul. 3* [*1919*], *pp. 38*).—This is an outline of the plans for the administration and supervision of vocational education in Nebraska for 1919–20.

The training of teachers of agriculture will be carried on in the Teachers' College and the College of Agriculture of the University of Nebraska. The course extends through 4 years, or 125 college semester hours. At least 40 hours of technical agriculture will be required of a graduate of a standard old-line college.

During 1919–20 teacher training in home economics will be carried on in the University of Nebraska only. A plan for the improvement of home economics teachers in service and for itinerant teaching is included. Provisions have been made for observation and practice teaching in the Nebraska School of Agriculture and in high schools offering vocational agriculture and home economics. A suggested 4-year course in vocational agriculture, requiring 180 minutes per day for vocational agriculture, a type course of study for all-day (6 hours) schools or classes in home economics where the vocational half day is devoted entirely to home economics subjects, and 4-year courses for teachers of agriculture and home economics are outlined.

Plans for vocational education under the Smith-Hughes Act in Utah, 1919–20 (*Salt Lake City, Utah: Dept. Pub. Instr., 1919, pp. 64*).—This is a statement of the plans of organization, administration, and supervision of vocational education in Utah under the Smith-Hughes Act for 1919–20, followed by the text of two acts of the 1919 State legislature. One of these reaccepts the benefits of the Federal law for the promotion of vocational education and appropriates $100,000 to aid in vocational, health, and civic education in the State. The other provides for the establishment of part-time schools, and requires attendance therein up to 144 hours for persons between 14 and 18 years of age who are excluded from regular schools. Type courses in vocational agriculture and home economics are outlined.

Vocational education: Plan of the State Board for Vocational Education (*Bul. State Bd. Ed.* [*Va.*], *2* (*1919*), *No. 2, Sup. 4, pp. 40*).—This is a statement of the plan for vocational education in Virginia for 1919–20.

It is proposed to devote 33⅓ per cent of the total available teacher-training funds for training in agriculture and home economics, respectively. A 4-year course for the training of white teachers of agriculture has been established at the Virginia Polytechnic Institute. It will consist of 60 hours distributed between agriculture 24 hours, science 15 hours, nonvocational subjects 12 hours, and educational subjects 15 per cent of the total 4-year course. A 2-year course consisting of at least 30 college hours for the training of colored teachers of agriculture has been established at the Virginia Normal and Industrial Institute at Petersburg.

Four-year courses for the training of white teachers in home economics are given at the Harrisonburg State Normal and Industrial School for Women and the College of William and Mary. Approximately 120 credits are required. A 2-year teacher-training course in home economics for colored teachers will be offered at the Virginia Normal and Industrial Institute, with approximately 60 credits required.

Outlines of a course for departments of vocational agriculture from the eighth to the eleventh grades, inclusive, of proposed 2-year courses in vocational home economics, 4-year teacher-training courses in vocational agriculture and home economics for white students, and 2-year normal courses in vocational agriculture and home economics for colored students are included.

Methods in supervised practice for vocational agricultural classes and schools under the Smith-Hughes law, R. D. MALTBY (*Ga. State Vocat. Bd. [Bul.], 5 [1919], pp. 55*).—This bulletin, which is the first of a series on methods of instruction in schools of secondary grade, discusses the object of directed or supervised practice in agriculture, the requirements of the Smith-Hughes law and of the State regarding it, its relation to technical instruction, and methods of supervision. Methods are suggested in carrying out supervised practice work by means of home projects and home practicums for day and boarding pupils. A procedure is briefly outlined by which the work of the school farm may be conducted as a normal farm and the production increased instead of reduced, as is the usual custom on school farms. The farm may be worked as one project by the whole school, or, as individual or group projects, as a part of the whole. The group project is preferred for the average boarding school. A suggestive basis for grading project work, problems for the four years' work, types of projects and of practicums or special problems, directions for using the project study outline, a project study outline for peanuts, and report and record forms are appended.

Manual and note book for supervised practice in agriculture, A. W. NOLAN (*Bd. Vocat. Ed. Ill. Bul. 10 (1919), pp. 64*).—Specific suggestions are offered for the use of vocational teachers in directing or supervising the six months' farm practice work, including the home project, general farm operations, farm crafts employed in the preceding work, farm mechanics' achievements or minor projects, nature observations and studies, recreational activities, and community service and interests. The bulletin is also intended for the pupil as a guide for his practice and a record of his work on the blank forms which it contains.

Courses of study in vocational agriculture, A. W. NOLAN (*Bd. Vocat. Ed. Ill. Bul. 11 (1919), pp. 19*).—This bulletin contains (1) outlines of two types of approved courses in vocational agriculture, viz, the 4-year college entrance course, extending through 8 or 9 school months each year, plus the 6 months' required supervised practice in agriculture, and consisting of a total of 16 units, 3 or 4 of which are in agriculture, and the farmers' short course extending through 4 years of 5 or 6 months each, plus the 6 months' required supervised practice in agriculture, and consisting of a total of 16 units, 8 of which are in agriculture; (2) curriculum suggestions with reference to organized subject matter studies, farm operation units and project studies, and short course or extension schools for adult farmers extending from 1 to 6 weeks; (3) lesson plans in teaching vocational agriculture; and (4) some suggested texts for the courses in agriculture.

An introduction to agriculture, A. A. UPHAM and G. A. SCHMIDT (*New York: D. Appleton & Co., 1919, rev. ed., pp. VIII+368, figs. 154*).—This is a complete revision and amplification of this text, previously noted (E. S. R., 28, p. 294), and is based upon the courses of instruction in agriculture published by the various States. Chapters on home projects and school gardens have been added. Questions and problems and references to helpful literature are appended to the chapters.

Exercises in plant life for vocational agricultural schools, J. T. WHEELER (*Ga. State Vocat. Bd. [Bul.] 6 [1919], pp. 48*).—This bulletin is intended as a guide to teachers in developing class and laboratory exercises in agriculture. Twenty-four lessons are outlined, consisting of 44 exercises, each suggesting topics, materials, procedure, and some references. An appendix contains a list of equipment and supplies selected on the basis of 10 students, together with current prices, a minimum equipment for the first year's work being estimated at $150, and a list of reference books for vocational schools.

Exercises in soils and fertilizers for vocational and agricultural schools, J. T. Wheeler (*Ga. State Vocat. Bd.* [*Bul.*] *7* [*1919*], *pp. 40*).—This is the third of the series of bulletins on methods of instruction in agriculture for secondary schools. It contains lessons 25 to 54 inclusive, consisting of 47 exercises in soils and fertilizers.

Course of study in home economics for the public schools of Louisiana, C. C. Helbing (*Baton Rouge, La.: State Dept. Ed., 1919, 4. ed., pp. 50*).—This contains the rules governing departments of home economics in State approved high schools, an outline of the course of study for approved departments of home economics for the eighth to the eleventh grades inclusive, a suggested library of home economics, a list of educational exhibits, and a list of equipment estimated to cost for the kitchen and dining room $400 and for the sewing room $200.

Sewing for girls' club work, O. Powell (*U. S. Dept. Agr., Dept. Circ. 2* (*1919*), *pp. 20, figs. 15*).—Instructions are given for making uniforms and other equipment, including a gardening set, towels and dish cloths, emblems, sewing screen, table runners, and luncheon sets, for various club activities in a 4-year program. An outline of a 4-year program of sewing work for canning club girls is included.

Bibliography of home economics, C. A. Lyford (*Dept. Int., Bur. Ed. Bul. 46* (*1919*), *pp. 103*).—Foods and cooking make up one of the sections of this extended bibliography of bulletins, circulars, etc. Sections are also devoted to household activities, science related to home economics, teaching, and similar topics.

Report of the women's institutes of the Province of Ontario, 1918 (*Rpt. Women's Insts. Ontario, 1918, pt. 1, pp. 144, figs. 12*).—This eighteenth annual progress report is devoted largely to an account of the proceedings of the seventh annual convention of the Ontario Women's Institutes, which was postponed from the fall of 1918 to early February, 1919.

According to this report the institutes have continued to take a deep interest in all home problems—food, clothing, housing, health, literature, etc.; school problems—fairs, beautification of the school inside and out, school gardens, sanitation and water supply, securing and retaining the services of capable teachers, etc.; and community halls, traveling libraries, public libraries, parks, etc. While some 7,000 have taken advantage of the short course in home nursing and first aid, it is stated that there is evidence that the call for such instruction will be greatly increased now that the war is over. Attention is called to an announcement that a complete health survey of the public school children in the rural districts in the Province will be made through the cooperation of the Department of Education and the Women's Institutes Branch.

NOTES.

Arizona University and Station.—A tract of 20 acres has been purchased adjoining the date orchard and horticultural substation at Yuma. This purchase will enable the station to materially enlarge its work in the Yuma Valley.

The station has also begun the development of a tract of 160 acres on the Yuma Mesa, where citrus fruits will be tested to determine their adaptation to the mesa lands. This tract is located on the portion of the mesa to be first developed by the U. S. Reclamation Service and it is the plan to have water on the unit in two or three years, but the station is installing its own pumping plant and expects to begin irrigating its first plantings in March.

Recent appointments in the college of agriculture include H. H. Gibson as professor of agricultural education, R. N. Davis as dairy extension specialist, and D. W. Albert as assistant in horticulture. N. L. Harris, extension poultryman, has resigned to take up similar work at the Kansas College.

Connecticut College.—A number of so-called $1,000 poultry clubs have been organized by the extension division, whereby sufficient birds are grouped to produce aggregate net earnings of about $1,000 per year. Under this plan three members of the leading club of the State will be, if properly prepared, admitted to the four-year course of the college each year, and permitted to take their hens with them as a means of helping to meet expenses. The college will furnish housing for these flocks at a low rental, supply feed at wholesale rates, and market the eggs with its own product. Three students have recently been admitted under this plan.

Delaware Station.—Newton L. Partridge, research horticulturist, has resigned to become extension assistant professor of pomology in the Iowa College and has entered upon his duties.

Georgia Coastal Plains Station.—This station was authorized by the 1918 legislature under an act passed August 18, 1918. This act provided for an agricultural experiment station and experimental farm for making scientific investigations and experiments respecting the principles and applications of agricultural science, and more particularly as these may be affected by soil and climatic conditions in the Coastal Plains region. It is entirely distinct from both the Georgia College and the Georgia Station, a separate governing board being provided consisting of the governor, the State commissioner of agriculture, and seven members appointed by the governor from the Coastal Plains section of the State.

The station has recently been established at Tifton, where the town has given a tract of 204 acres of land and $25,000 in cash for buildings, land clearing, and maintenance of the experimental work. The 1919 legislature also appropriated $25,000 for maintenance. S. H. Starr, adjunct professor of farm management of the Georgia College, has been appointed director of the new station.

Nebraska University and Station.—Under a law passed by the 1919 legislature, tests of all types of liquid fuel tractor engines sold in the State are required to be made by a board of three engineers designated by the university.

These tests are to consist of engine runs, official rating of horsepower for conditions held, and consumption of fuel per hour and per acre of farm operations, and the results are to be open for public inspection by posting at the agricultural engineering department and elsewhere. A system of permits is provided, these to be revoked for misrepresentation or for failure to maintain adequate service stations. The administration of the law is vested in the State Railway Commission.

L. W. Chase, E. E. Brackett, and O. W. Sjogren of the department of agricultural engineering have been designated as the board of tractor test engineers. C. K. Shedd, professor of agricultural engineering, has been appointed manager of the tractor tests.

Pennsylvania College and Station.—The resignations are noted of John R. Bechtel, assistant professor of vegetable gardening and assistant horticulturist; E. A. Siegler, instructor in plant pathology; and D. H. Stewart, assistant in agricultural extension, effective January 1, February 16, and January 15, respectively. Recent appointments include Willis B. Combs, assistant professor of dairy husbandry at the University of Missouri, as assistant professor of dairy manufactures; J. B. R. Dickey, extension specialist in agronomy and soils at Rutgers College, as assistant professor of agronomy extension; John R. Haswell as assistant professor of farm mechanics extension; and J. L. Horsfall as instructor in economic entomology.

Washington College and Station.—Contracts have been let for the completion of the third floor of Wilson Hall, the new agricultural building, and the work is under way. The departments of soils and plant pathology are to occupy the new quarters when completed.

A. M. Doerner, instructor in landscape gardening in the Kansas College, has been appointed assistant professor of landscape gardening and floriculture, beginning February 1, vice D. R. Hull, resigned to enter commercial work.

Agricultural Training for Ex-service Men in Canada.—A recent report of operations in Canada in aiding returning soldiers and sailors in land settlement states that training centers for prospective settlers have been established at Kentville, N. S., Fredericton, N. B., Lennoxville, Que., and Matsqui, B. C. Additional centers are to be located at Elkhorn, Man., and Esty, Alta. Already 513 men have completed their training, and 703 others are now at training centers or gaining experience with successful farmers. About $45,000 has been expended in allowances for subsistence of soldiers and their dependents during the training period.

Agricultural Research in the West Indies.—An agricultural experiment station at Haina, Santo Domingo, was officially opened on September 20, 1919. Recently Meliton Gomez gave to the Department of Agriculture a tract of land near Puerta Plata for use as a station.

Steps are being taken preliminary to the establishment of a college of agriculture on land adjoining the experiment station in the city of Santo Domingo. The buildings to be erected will accommodate from 36 to 40 students, one student being sent from each Province annually. The Government will defray the expenses of the 3-year course, including instruction, general equipment, books, etc., the student paying only for board and laundry.

A cooperative cacao society has lately been formed in San Pedro de Macoris, and is planning to establish an experiment station nearby where new systems of cultivation, drainage, and farming will be tried. A stock breeding station may also be established by the society to improve the live stock in the Province.

Under a law of August 19, 1919, higher primary instruction in Haiti will extend over a period varying from 2 to 4 years, and will include instruction in practical agriculture. The Government has established an experimental farm at Thor, a commune of Port-au-Prince. A number of resident students are already attending the agricultural course given at the farm, and the Government is seeking additional students.

The Cuban Department of Agriculture has accepted the gift of several tracts of land from the townships of Ciego de Avila and Bayamo in the Provinces of Camaguey and Oriente, for the purpose of establishing breeding stations for horses, mules, cattle, and hogs.

Agricultural Education and Research in Latin America.—The Department of Agriculture of Argentina has been offering about 15 courses in rural domestic science for women in the principal rural centers of the Provinces of Buenos Aires, Santa Fe, Entre Rios, Cordoba, La Rioja, Tucuman, Catamarca, Santiago del Estero, and Salta. The instruction has been given by graduates of the Rural Domestic Science School of Tandil, and has dealt principally with dairying, butter and cheese making, aviculture, apiculture, raising hogs, arboriculture, horticulture, and the conservation of fruits and vegetables. The courses have been attended by more than 500 farmers' daughters. Steps are being taken in Tucuman and other places toward establishing the schools on a permanent basis. The government has offered six scholarships to Nicaraguan students, two being for the school of agriculture at Tucuman and four for the school of agriculture at Mendoza; also two scholarships for Bolivian students in each of its 10 agricultural schools.

An extra session of the Bolivian National Congress was called to consider, among other questions, the establishment of a bureau of agriculture and stock raising, a national agronomic and veterinary institute in Trinidad, and a school of agriculture and stock raising at Cordillera. Looms and equipment for weaving the wool have been added to the experiment station established some time ago at Ucha-Ucha with the object of raising alpacas, noted in the Andean tablelands of South America, for the fine quality of the long silk wool which they produce. The factory is now turning out a fine grade of pure woolen fabrics, which are said to be in great demand in the Republic.

The President of Brazil has authorized the establishment of an agricultural station at Caxambu in the southern part of the State of Minas Geraes. This station has made a specialty of gardening and fruit culture, and will train abandoned children as farm hands and garden workers. Under an executive decree of September 6, 1918, approximately $25,000 was made available for the maintenance during the present year of 96 schools of agriculture in the agricultural colonies of the State of Parana.

Agricultural development in Ecuador has been greatly stimulated since the Bureau of Agricultural Encouragement (Direccion de Fomento Agricola) was established by legislative decree. At the present time, in accordance with a law of October 26, 1918, there are 54 agricultural development boards in operation in the capitals of the provinces and cantons. These boards have large powers concerning rules and regulations, taxes, loans, etc., within their respective jurisdictions.

The President of Guatemala has authorized the Board of Agriculture of the Department of Huehuetenango to collect annually 10 per cent of the product of the communal crops of that district in order to secure sufficient funds for a new agricultural experiment station on public land at the capital (Huehuetenango) of this department. This station will be used primarily for the purpose of cultivating hemp-producing fibers and preparing selected seed.

At the request of the stockmen's society, the Paraguayan Congress has ceded to it, for the term of 10 years, 10 hectares of land of the botanical garden to be used as an experiment station for live stock improvement.

In Peru a practical school of agriculture has been established in Santa Maria, in the district of Campina de Huacho. Practical instruction in agricultural subjects will be given to residents of that section.

C. A. Davila, chief of the agricultural station at Caracas, Venezuela, has begun the installation of an experimental station at Maracay, capital of the State of Aragua.

A meterological station at Temuco, Chile, was officially opened early in September, 1919.

Industrial and Agricultural Institute in Angola, West Africa.—The West Central Africa Mission Conference of the Methodist Episcopal Church has recently purchased a farm of 7,000 acres at Quessua, six miles from Malanje, the capital of Loanda district, Angola, for development as an agricultural institute. This farm is located in the midst of a rich agricultural region and includes grazing, irrigable and dry farming lands, as well as wooded slopes and rock and clay for building materials. About 700 acres have been under cultivation, and a large part of the tract is covered with scattered scrub growth which can be easily cleared. The elevation is about 3,800 ft., giving a healthful and invigorating climate. The rainfall is from 40 to 60 in., the rainy season extending from about September 15 to May 15.

In developing the institute it is planned to establish first a small boarding school, gradually enlarging the enterprise to include such activities as farm demonstrations, agricultural clubs, fairs, and judging contests, experiments in crop introduction and improvement, short courses to train native preachers and others for extension work, etc.

H. A. Longworth, a graduate of the Iowa College, has been appointed agricultural missionary in charge of the undertaking.

New Journals.—*Genetica* is being published semimonthly as a Dutch journal of evolution and heredity, with Dr. J. P. Lotsy of Haarleem as editor. It will consist of original articles in Dutch (foreign authors may offer résumés in their native languages), critical reviews, compilations, abstracts, and lists of books and articles relating to evolution and heredity. The first five numbers include literature from Dutch, Scandinavian, United States, French, English, and German sources.

Journal de la Société Nationale de Agriculteurs de Belgique is being issued weekly as the organ of this society. The initial number contains an explanation of the purpose of the journal, the constitution of the new society and several articles, including plans for rebuilding farm houses and stables. It is hoped to deal especially with reconstruction problems.

The Commonwealth Institute of Science and Industry of Australia has established *Science and Industry* as its monthly organ. The initial number contains articles on Applied Science: What it Connotes, by Sir Girard Muntz; The Prickly Pear Pest, by J. B. Cleland; Technical Education, by G. D. Delprat; Obligations of Science to the Pastoral Industry, Freedom for Research, by E. J. Russell; Applications of Veterinary Research, with an Example, by H. A. Woodruff; Chemists and Industry: Some Points for Consideration, by A. C. D. Rivett; Artesian Water Problems, by H. C. Richards; Leaks in Fruit Containers, by R. Greig-Smith; Tick Resistant Cattle: Mr. Munro Hull's Claims, by T. H. Johnson and Miss M. J. Bancroft; and Sheep Fly Investigations.

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RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Problems and methods in agricultural research, H. J. WHEELER (*Jour. Indus. and Engin. Chem., 11 (1919), No. 11, pp. 1056–1060*).—In this address, delivered at the meeting of the American Chemical Society in Philadelphia September 8, 1919, the author reviews the early work in agricultural chemistry in this country and suggests and comments upon certain present-day problems in agricultural research which depend for their solution upon chemical investigations.

The examination of the college trained chemist for Government service, W. J. COTTON (*Jour. Indus. and Engin. Chem., 11 (1919), No. 12, pp. 1142–1144*).—This paper consists of a discussion of the education rating given on the chemistry examinations of the U. S. Civil Service Commission, together with a criticism of college chemistry courses as based upon a study of the catalogues of 488 institutions of college grade.

The hydrolysis of stizolobin, the globulin of the Chinese velvet bean, Stizolobium niveum, D. B. JONES and C. O. JOHNS (*Jour. Biol. Chem., 40 (1919), No. 2, pp. 435–448*).—The percentage composition of stizolobin, the globulin of the Chinese velvet bean isolated by Johns and Finks (E. S. R., 39, p. 202), as determined by hydrolysis and esterification of the resulting amino acids is reported as follows: Glycin 1.66 per cent, alanin 2.41, valin 2.88, leucin 9.02, prolin 4, phenylalanin 3.1, aspartic acid 5.7, glutaminic acid 14.59, hydroxyglutaminic acid 2.81, serin 0.67, tyrosin 6.24, cystin 1.13, arginin 7.14, histidin 2.27, lysin 8.51, tryptophan present, and ammonia 1.55 per cent.

A method for the determination of prolin without involving the esterification of the amino acids is described. This consists essentially in removing the bases and mineral acids from the hydrolysis products of the protein, extracting the prolin from the dry residue by boiling absolute alcohol, and determining the nonamino nitrogen in the solution. The results obtained by this method agreed closely with each other and with the percentage obtained by the ester method.

Some of the residues obtained from the direct determination of prolin were examined for aspartic, glutaminic, and hydroxyglutaminic acids by the method of Dakin previously noted (E. S. R., 40, p. 611). The yield of aspartic acid was 9.23 per cent as compared with 5.7 obtained by the ester method, which is thought to indicate that the percentages of aspartic acid obtained in previous hydrolyses of proteins are probably too low. Hydroxyglutaminic acid was obtained to the extent of 2.81 per cent.

The authors are of the opinion that "the method outlined by Dakin will doubtless prove of great value in the further development of methods for the direct separation and determination of the products of hydrolysis of proteins."

The isoelectric points of the proteins in certain vegetable juices, E. J. Cohn, J. Gross, and O. C. Johnson (*Jour. Gen. Physiol., 2 (1919), No. 2, pp. 145–160, figs. 3*).—With a view to obtaining more light on possible changes in the proteins of vegetables during dehydration, the authors have made a study of the isoelectric point of the proteins of potato, carrot, and tomato juices. The isoelectric point, or the H-ion concentration at which the proteins exist most nearly uncombined, was determined by the method of cataphoresis. The juice of the vegetable was placed in a U-tube between electrodes charged with a potential difference and the direction of the protein migration followed by determining the nitrogen in the arms of the U-tube and by heating the liquid from the arms and noting the appearance of coagulated protein. The apparatus employed in the determination is described and illustrated.

The H-ion concentration of the filtered juice of the potato was found to be in the neighborhood of 10^{-7}N, the juice containing from 1 to 2 per cent of tuberin, which migrated during cataphoresis to the anode. The addition of acid liberated tuberin at its isoelectric point at an H-ion concentration slightly lower than 10^{-4}N. A slight precipitate, the nature of which was undetermined, was formed when the potato juice was made slightly alkaline. The properties of carrot juice were very similar, except that the alkaline precipitate was nearly twice as great as the acid precipitate. The isoelectric point of the protein was the same as that of tuberin. The protein of the tomato was not present to any extent in tomato juice, owing to the high concentration of organic acids resulting in an H-ion concentration of nearly 10^{-4}N, which is the isoelectric point of the protein. On neutralizing the acidity of the tomato, the protein dissolved and migrated to the anode.

The carbohydrates of fresh and dehydrated vegetables, K. G. Falk (*Jour. Indus. and Engin. Chem., 11 (1919), No. 12, p. 1133*).—A study of the carbohydrate content and distribution in fresh, air-dehydrated, and vacuum-dehydrated carrots, potatoes, cabbages, and white turnips is reported. This indicates that the process of dehydration brings about no change in the carbohydrate distribution such as a breakdown of the more complex to the simpler constituents.

Egyptian lettuce oil, E. Griffiths-Jones (*Dept. Pub. Health Egypt, Rpts. and Notes Pub. Health Labs., No. 1 (1917), pp. 45–51*).—Analyses are given of several samples of Egyptian lettuce oil obtained by expression from the seeds of *Lactuca scariola oleifera*, a variety of the prickly lettuce. It is said that considerable quantities of this oil are consumed annually in Egypt, and the possibility is suggested of its being sent to other countries, either as an adulterant of other oils or as a constituent of vegetable margarins.

The oil when filtered and dried is of a clear golden color, a characteristic and rather pleasant taste, and a slight odor. Of the six samples examined there was very little variation in the constants obtained with the exception of the acidity, which was low in the oil obtained from freshly gathered seeds and high in the other samples. The constants of a sample of oil expressed from seeds purchased in the native bazaar are as follows: Oil content of seeds (petroleum ether extract) 36.3 per cent, refractive index at 40° C. 1.469, specific gravity at 15.5° C. 0.9334, iodin number (Hübl) 122, saponification number 190.6, acidity number 8.5, Reichert Meissl number 0.8, Polenske number 0.2, acetyl number 26.5, unsaponifiable matter 0.5, and Maumené number 92.5.

The proteolytic activity of pancreatic amylase preparations, H. C. Sherman and D. E. Neun (*Jour. Amer. Chem. Soc., 41 (1919), No. 11, pp. 1855–*

1862).—This paper reports the results of a further study of the relationship between the amylolytic and proteolytic activities of purified pancreatic amylase preparations, which has been previously pointed out by the authors (E. S. R., 39, p. 669). The usual methods of purifying the enzym were employed, with the exception that for the usual final precipitation with 1:1 alcohol-ether a 2:1 mixture of alcohol and ether was used, the product thus obtained being called precipitate A, after which a second precipitate B was obtained by adding more ether. Precipitate A was separated by centrifugal force, the centrifuge being cooled with liquid air, and precipitate B, by filtration after the addition to the solution decanted from the precipitate A of an amount of ether equal to half its volume.

The amylolytic activity of precipitate A was lower, and the proteolytic activity higher, than the corresponding activities of B. Of the total enzymic activity of the pancreatic powder employed, a larger proportion of the proteolytic than of the amylolytic power was recovered. This loss of amylolytic activity is attributed partly to the extra manipulation, amylolytic activity having a tendency to deteriorate more rapidly than proteolytic.

The facts observed " suggest the possibility that the amylolytic and proteolytic activities may in this case be the characteristic properties of interrelated substances or may conceivably be two properties of the same substance, analogous to the finding of Wells and Osborne (E. S. R., 30, p. 680) that a single isolated protein (hordein or gliadin) may contain more than one antigenic radical.

The chemical identification of thyroxin, II, E. C. Kendall and A. E. Osterberg (*Jour. Biol. Chem., 40* (*1919*), *No. 2, pp. 265–334, figs. 30*).—This paper reports a detailed study of the constitution of thyroxin, the isolation of which from the thyroid gland was reported in the first paper of the series (E. S. R., 41, p. 409). The most important physical and chemical properties of the substance are discussed, and illustrations are given of the many crystalline forms it assumes under different conditions and of some of the salts formed with metals and with acids. The structural formula of thyroxin has been established as 4, 5, 6, trihydro, — 4, 5, 6, triiodo, — 2 oxy, — beta indolpropionic acid.

Influence of aspartic acid and asparagin upon the enzymic hydrolysis of starch, H. C. Sherman and F. Walker (*Jour. Amer. Chem. Soc., 41* (*1919*), *No. 11, pp. 1866–1873*).—The conflicting results obtained by various workers as to the effect of amino acids upon amylase activity are reviewed briefly, and the first of a series of experiments are reported which are planned to include a systematic study of the influence of various amino acids upon the action of several amylases in purified as well as in their natural or commercial forms. The results obtained are summarized as follows:

"The action of saliva, pancreatin, and purified pancreatic amylase on alkali-washed potato, wheat, maize, and rice starches, and on Lintner 'soluble' starch was accelerated by the addition of small amounts of boiled, neutralized water-extract of potato, while the action of the vegetable amylases tested was not influenced by the addition of the potato extract. The addition of neutralized aspartic acid or asparagin accelerated the action of saliva, pancreatin, and purified pancreatic and malt amylases. Clear evidence of activation was not obtained in the case of malt extract or the preparations made from *Aspergillus oryzæ*. The addition of both sodium aspartate and asparagin to the same digestion mixture produces practically the same activation as does one of these substances alone. Thus the activating effects of these substances are interchangeable rather than additive."

In conclusion the question is raised as to the specificity of this activation, and it is pointed out that it is not due to change in H-ion concentration nor merely to a more favorable concentration of electrolyte.

Contribution to the biochemistry of the soy bean enzym (urease), D. H. Wester (*Chem. Weekbl., 16 (1919), No. 47, pp. 1442–1454*).—Data on the effect of various factors on the determination of urea by the extract of soy beans are reported and summarized as follows:

The strength of the enzym, unless very dilute, has no effect upon the reaction. In all cases the amount of ammonium carbonate formed is proportional to the amount of urea, thus indicating that the reaction products have no harmful effect upon the enzym. The urea solution should be freshly prepared, but the urease solution does not alter on standing. Urease can be as readily extracted by a 50 per cent glycerin solution as by water. An extract of jack beans acts in most respects like soy bean extract.

The combination of enzym and substrate.—I, A method for the quantitative determination of pepsin.—II, The effect of the hydrogen-ion concentration, J. H. Northrop (*Jour. Gen. Physiol., 2 (1919), No. 2, pp. 113–122, figs. 3*).—A quantitative method for the determination of pepsin is described which depends upon the change in conductivity during the digestion of egg albumin by pepsin, the time necessary to cause any given change being inversely proportional to the amount of pepsin present. By the use of this method the author has determined the amount of pepsin removed from solution by different substances, the effect of size of particles of egg albumin coagulated, dried, and ground, and the effect of the H-ion concentration.

The amount of pepsin removed from solution by a given weight of substrate was found to be independent of the size of the particles of the substrate. The optimum zone of H-ion concentration for the combination of enzym and substrate was found to correspond to the optimum for digestion. It is suggested that the quantity of ionized protein present determines the amount of pepsin which combines with the protein, and hence determines the rate of digestion.

The sensitiveness of living yeast to hydrogen- and hydroxyl-ion concentration, H. von Euler and F. Emberg (*Ztschr. Biol., 69 (1919), No. 8–9, pp. 349–364, figs. 5*).—A study of bottom yeast is reported, which indicates that the sensitiveness to acid and alkali of the process of inversion by the living yeast cell is similar to that of the isolated enzym, thus suggesting that the enzym exists in the free state in the cell. By altering the H-ion concentration of the yeast (pH 3.5–3.8 and 6.6–7.2), the inverting action was little affected, but appreciable changes in the rate of growth and in the composition of the yeast cells were noted.

Strengthening of catalase action in yeast cells, H. von Euler and R. Blix (*Hoppe-Seyler's Ztschr. Physiol. Chem., 105 (1919), No. 3–4, pp. 83–114, figs. 2*).—Essentially noted from another source (E. S. R., 41, p. 409).

Yeast growth and alcoholic fermentation by living yeast, A. Slator (*Jour. Soc. Chem. Indus., 38 (1919), No. 20, pp. 391R, 392R, fig. 1*).—The author discusses, with references to the literature on the subject, the main factors which determine the rate of growth of yeast and the rate of fermentation at different stages of the reaction.

Some experiments conducted with pure cultures of bread yeast, W. F. Henderson (*Trans. Amer. Micros. Soc., 38 (1919), No. 3, pp. 221–228, pls. 2*).—Studies of the growth of commercial "Yeast Foam" under varying conditions are reported, from which the conclusions are drawn that glucose and levulose cause yeast to grow much more rapidly with a more rapid production of carbon dioxid than any of the other common sugars, that yeast grows better under aerobic than anaerobic conditions, and that a solid medium may alter the morphological characters of the individual yeast cells by a tendency to localize the food supply.

Para cymene, II, III, H. A. LUBS and R. C. YOUNG (*Jour. Indus. and Engin. Chem., 11 (1919), Nos. 5, pp. 455, 456; 12, pp. 1130–1133*).—The first of these papers deals with the utilization of cymene for the preparation of photographic developers, by H. A. Lubs; the second with the preparation of 2-chloro-5, 6-dinitrocymene, by H. A. Lubs and R. C. Young.

Phthalic anhydrid, II, III, K. P. MONROE (*Jour. Indus. and Engin. Chem., 11 (1919), No. 12, pp. 1116–1120, figs. 4*).—The first of these papers deals with the melting point of pure phthalic anhydrid and the system phthalic anhydrid-phthalic acid; the second with the system naphthalin-phthalic anhydrid.

The chemistry of Burgundy mixtures, R. L. MOND and C. HEBERLEIN (*Jour. Chem. Soc. [London], 115 (1919), No. 682, pp. 908–922, pl. 1, figs. 2; abs. in Nature [London], 104 (1919), No. 2604, p. 82*).—This paper consists of the results of an investigation of the chemical reaction taking place when sodium carbonate and copper sulphate are mixed in solution, as in Burgundy mixtures. The authors conclude that "the chemistry of Burgundy mixture is of a much more complex nature than previously suspected."

Chemicals received by the Bureau of Chemistry during the war, H. E. BUC (*Jour. Indus. and Engin. Chem., 11 (1919), No. 12, pp. 1140, 1141*).—The author reports that during the last four years about 1,800 shipments of chemicals from a large number of dealers and manufacturers were tested at the Bureau of Chemistry, U. S. Department of Agriculture. The general results of the tests are summarized as follows:

"The standard acids, ammonia, alkali salts and alkali, and most of the organic solvents are generally satisfactory. The soluble salts, other than alkali salts, are generally acceptable, but are seldom of a high degree of purity. Certain organic solvents and solids are either unobtainable or unsatisfactory. The insoluble products are generally unfit for use in analytical work."

A nitrogen generator for laboratory use, W. L. BADGER (*Jour. Indus. and Engin. Chem., 11 (1919), No. 11, pp. 1052, 1053, fig. 1*).—A simple apparatus is described by means of which nitrogen can be generated by the use of copper and an ammoniacal solution of ammonium chlorid.

A simple method for the determination of nitrogen in nitrates and nitrites, T. ARND (*Ztschr. Angew. Chem., 30 (1917), No. 53, 1. Aufsatzteil, pp. 169–172*).—Several methods for determining nitrogen in nitrates and nitrites are discussed, and a new method is described as follows:

Place 250 cc. of the solution containing about 0.5 gm. of nitrogen as nitrate or nitrite in a distilling flask, add 5 cc. of 20 per cent magnesium chlorid solution and 3 gm. of an alloy consisting of 60 per cent of copper and 40 per cent of magnesium, and distill at once, collecting from 200 to 250 cc. in standard acid.

On the relative accuracy of colorimetric and titrimetric procedures for determining nitrogen as ammonia, E. R. ALLEN and B. S. DAVISSON (*Jour. Biol. Chem., 40 (1919), No. 1, pp. 183–197*).—The relative accuracy of the colorimetric method of Folin and Farmer (E. S. R., 29, p. 508) and the titrimetric method of Mitscherlich, Herz, and Merres (E. S. R., 21, p. 208) for determining nitrogen as ammonia was studied by calculating the probable errors in the two methods as determined for a series of results obtained under carefully controlled conditions.

The error in the colorimetric method was found to increase with increasing amounts of nitrogen, and to be due in part to error in measurement and in part to differences in the amounts of color produced by the reagent under the conditions of the determinations. In the titration method the principal errors are due to distillation and titration.

The paper also includes directions for the preparation, preservation, and use of N/50 acid for the titrimetric procedure and a discussion of advantages of this procedure over the colorimetric other than those brought out in the experimental data presented.

The estimation of cyanogen compounds in concentrated ammonia liquor.—II, The estimation of thiocarbonate, P. E. SPIELMANN and H. WOOD (*Jour. Soc. Chem. Indus., 38 (1919), No. 20, pp. 369T, 370T*).—The method previously noted (E. S. R., 41, p. 113) has been extended to include the determination of thiocarbonate, which is usually present in ammonia liquor. It was found that digestion for 45 minutes at from 70 to 75° C. will convert thiocarbonate completely into thiocyanate without affecting the cyanid, and that digestion with ammonium polysulphid at from 30 to 35° will convert cyanid to thiocyanate in half an hour without attacking thiocarbonate.

For the complete determination, separate quantities of 25 cc. of liquor are taken for each estimation. In determining the thiocyanate as such, the liquor should be kept as cold as possible during acidification. For cyanid and thiocyanate the liquid is digested at 30° for half an hour with an excess of ammonium polysulphid, and for thiocarbonate and thiocyanate the liquid is diluted with 15 cc. of water, 10 cc. of strong ammonia is added, and digestion at 75° continued for 45 minutes.

The sensitiveness of some cyanid reactions, J. B. EKELEY and I. C. MACY (*Proc. Colo. Sci. Soc., 11 (1919), pp. 269–274, fig. 1*).—A study of the sensitiveness of some cyanid reactions is reported with the following results:

The Prussian blue test upon potassium cyanid solutions direct was found to be sensitive to a dilution of 1:70,000 as KCN, corresponding to a dilution of about 1:170,000 for HCN in the original solution, and upon the distillate from potassium cyanid solutions after acidification with tartaric acid was sensitive to a dilution of 1:700,000 as KCN, corresponding to 1:1,700,000 as HCN; the hanging drop method with silver nitrate was sensitive to a dilution of 1:8,000,000 as KCN, or about 1:19,000,000 as HCN; the Schönbein test was sensitive to a dilution of 1:18,000,000 in the light and 1:23,000,000 in the dark as KCN and of 1:43,000,000 in the light and 1:55,000,000 in the dark as HCN.

The conclusion is drawn that "the Schönbein test should, therefore, be carried out in closed vessels in the dark to get trustworthy results, and only in extreme dilutions does it indicate the presence of hydrocyanic acid and exclude the presence of other substances which are known to respond at high concentrations."

The microtitration of arsenic, H. H. GREEN (*Rpts. Dir. Vet. Research, Union So. Africa, 5–6 (1918), pp. 541–550, fig. 1*).—The difficulty in obtaining accurate results in the determination of small amounts of arsenic in physiological material is discussed, and a microtitration method is described which is considered by the author to be more reliable and more rapid than the ordinary colorimetric determinations and to require very little personal attention.

In the method described the arsenic is liberated as arsine, collected in dilute silver nitrate, and the arsenious oxid formed titrated directly with N/495 iodin (1 cc.=0.1 mg. As_2O_3) after the addition of bicarbonate and sufficient potassium iodid to keep all excess of silver salt in solution. The apparatus required is simple, consisting of an ordinary hydrogen generator connected in series with three test tubes containing silver nitrate, the first in concentration of between N/20 and N/100 according to the amount of arsenic expected, the second in a more dilute solution, and the third more concentrated to serve as a check on possible loss of arsine by too rapid evolution of gas from the generator. The titration, after from 20 to 40 minutes' vigorous passage of the gas, is carried out by washing the first two tubes into a small flask with a few cubic centimeters of water and ignoring, usually, the third tube.

Data are given showing a recovery of 98 per cent with 1 mg. of arsenic and of 95 per cent with 0.1 mg. It is claimed that, in working with physiologic material, by using a correction curve a degree of accuracy within ± 5 per cent may be obtained on all quantities above 0.1 mg. and within ± 10 per cent for as small amounts as 0.05 mg.

A new titration method for the determination of hydrogen sulphid in sewage, W. Marzahn (*Hyg. Rundschau, 29 (1919), No. 16, pp. 557–560, fig. 1*).—The method described consists essentially in distilling the hydrogen sulphid into a solution of calcium acetate, converting the cadmium sulphid into cadmium iodid by the action of iodin, and titrating the excess of iodin with sodium thiosulphate.

The use of nickel crucibles for the J. Lawrence Smith fusion in determining soil potassium, S. S. Walker (*Jour. Indus. and Engin. Chem., 11 (1919), No. 12, pp. 1139, 1140*).—The feasibility of substituting nickel crucibles for platinum ones in fusing soils for total potassium by the J. Lawrence Smith method was studied at the Louisiana Experiment Stations by means of duplicate fusions made on a number of soils, using a platinum crucible for one duplicate and a nickel crucible for the other. No appreciable difference in the weights of the potassium platinic chlorid was obtained in the duplicate determinations, but the nickel crucibles were found to be less satisfactory than the platinum, owing to the fact that they are decidedly attacked by the fusion mixture with the result that the inner surface soon becomes rough and pitted, making it somewhat difficult to remove the mass.

The gravimetric determination of sulphate as barium sulphate, J. M. Kolthoff and E. H. Vogelenzang (*Ztschr. Analyt. Chem., 58 (1919), No. 2, pp. 49–69*).—Previously noted from another source (E. S. R., 41, p. 205).

Fat extraction apparatus, J. M. Pickel (*Jour. Indus. and Engin. Chem., 11 (1919), No. 11, pp. 1053–1055, figs. 3*).—The advantages claimed for the fat extraction apparatus described and illustrated in this paper are that 20 extractions can be made simultaneously on one electric heater 4.5 by 24 in.; that only about 15 cc. of ether, one-third to one-half of which is recovered for future use, is required for each extraction, and that the ether is distilled off from the extract and recovered by merely giving the condenser a slight turn on its axis, thus involving no interruption of the distillation and no less of ether.

The preservation of milk for chemical analysis, L. S. Palmer and L. H. Cooledge (*Missouri Sta. Research Bul. 34 (1919), pp. 3–31*).—This bulletin reports a detailed study of the effect of various factors upon the preservation of milk for chemical analysis, including kind and amount of preservative, the temperature of preservation, the development of bacteria before adding the preservative, the amount of air in contact with the milk, the relative importance of bacteria and enzyms in causing decomposition, and the minimum quantity of the best preservative to use.

Of the preservatives tested—formaldehyde, mercuric chlorid, potassium dichromate, copper sulphate, thymol, and toluene—formaldehyde proved to be the most effective as shown by the least alteration in the constituents of the milk. The effect of the other factors studied is presented in analytical data, a study of which has led the author to recommend the following procedure as satisfactory for the preservation of all the constituents of milk for a period of several weeks.

"Mix the sample thoroughly as soon as drawn; measure carefully one liter and add between 1.5 and 2 cc. of formalin (containing approximately 40 per cent formaldehyde); place a suitable portion in a bottle, preferably a glass-stoppered one, filling the bottle about nine-tenths full; cool at once to 8–10°C. or lower, and maintain at that temperature until ready for analysis."

The heat coagulation of milk, H. H. Sommer and E. B. Hart (*Jour. Biol. Chem., 40 (1919), No. 1, pp. 137–151*).—A study of possible factors influencing the heat coagulation of different milk samples is reported and summarized as follows:

"The main factor in the heat coagulation of fresh milk is the composition of the milk salts. Apparently casein requires a definite optimum calcium content for its maximum stability. The calcium content of casein is largely controlled by the magnesium, citrates, and phosphates present.

"In fresh milk there is no relation between titratable acidity and heat coagulation. Acid fermentation in milk lowers the coagulating point by changing the reaction and by lowering the citric acid content. However, the titratable acidity of fresh milk samples varies so widely that it is impossible to determine the extent of acid fermentation by titration. Therefore it is impossible to use the acidity of milk as a criterion of coagulability.

"Difference in concentration accounts partly for the difference in coagulation of fresh milk samples. H-ion concentration is not the determining factor in fresh milk coagulation. It is nevertheless a factor in fresh milks, and in commercial milks it may become an important factor."

Potential acidity of milk and a standard method for its determination, R. W. Terry (*Jour. Amer. Pharm. Assoc., 8 (1919), No. 7, pp. 538–547, figs. 2*).—Data are given to show that the acidity of milk as determined by titration with N/10 NaOH is not proportionately reduced by the addition of water. This phenomenon has been determined by the author to be due to the greater hydrolysis in dilute solution of the tertiary calcium phosphate precipitated during the titration. The method of Van Slyke and Bosworth (E. S. R., 32, p. 606) for determining milk acidity by precipitating the calcium salts with neutral potassium oxalate is, in consequence, considered to give incorrect results in that the factor of soluble or suspended calcium salts is not taken into consideration.

The author disagrees with the deductions of Clark (E. S. R., 33, p. 163) on the inadvisability of adding lime water to cows' milk in modifications for infant feeding, and proposes the following theory regarding milk coagulation and its adulteration by alkalis:

"The hydrogen-ion concentration of milk or milk mixtures may, to a limited extent, influence the velocity of the function of rennin—that is, the conversion of caseinogen to paracasein—but this has little, if anything, to do with the conversion of paracasein to calcium paracaseinate (true milk curds). The velocity of this change is a function of potential calcium ionization, and potential calcium ionization is a function of potential acidity. Upon the rate of formation of the calcium paracaseinate depends its physical condition; the more rapidly it is formed, the more tough, impenetrable, and indigestible it is. By the proper reduction of potential acidity, the curd (calcium paracaseinate) of cows' milk is precipitated in a physical condition resembling the curd of human milk—soft, flocculent, and readily digestible. This is the desideratum in adding alkalis to cows' milk in artificial feeding."

A method, which if followed in detail is considered by the author to give accurate results for the potential acidity of milk, is outlined as follows:

Pipette 10 cc. of milk into a 100 cc. Erlenmeyer flask, add 5 drops of a 1 per cent alcoholic solution of phenolphthalein, and titrate with N/10 NaOH to the first noticeable pink tint that is permanent for one minute. One cc. of N/10 NaOH represents 10° of acidity. The titration should be performed only in daylight, and no water should be added before or during the titration.

Contribution to the study of methods of determining added water in milk, J. Goldan, jr. (*Ann. Chim. Analyt., 2. ser., 1 (1919), No. 2, pp. 342–345, fig. 1*).—This paper, translated from the Spanish by G. Pégurier, reports a study of various methods of determining added water in milk. As a result the conclusion is drawn that the simplified molecular coefficient of Mathieu and Ferré (E. S. R., 33, p. 208) gives the best indication of the addition of water to milk.

A method for the preliminary detection of abnormal milk based on the hydrogen-ion concentration, J. C. Baker and L. L. Van Slyke (*Jour. Biol. Chem., 40 (1919), No. 2, pp. 357–371*).—The method, which has been developed at the New York State Experiment Station, is based upon the use of brom-cresol purple, previously suggested by Clark and Lubs as a substitute for litmus for use in milk cultures (E. S. R., 37, p. 686).

The application of this indicator to the preliminary detection of abnormal milks consists in adding to one drop of a saturated solution of the dye 3 cc. of milk and then observing the color. In average milks that are normal in character the color produced is bluish gray. If the color differs appreciably from this, there is ground for suspicion that the milk is not normal. "The color given by different milks may be lighter or darker, ranging from a bright yellow at one extreme to a deep blue at the other. The color is made lighter by acids, acid salts, formaldehyde solution, and also by heating above the usual point of pasteurization. The color becomes deeper blue in the case of milk from diseased udders, watered milk, skimmed milk, and milk containing added alkali or an alkaline salt."

Attention is called to some conditions which modify the characteristic color given by brom-cresol purple with normal milk. The presence of extra fat (5 per cent or more) gives an appreciably lighter color than in the case of ordinary market milk containing from 3 to 4 per cent of fat. Skim milk gives a darker color than the same milk before the removal of fat. The decided yellow color of the milk produced by cows at fresh pasture modifies the color reaction with brom-cresol purple.

Detailed directions are given for the operation of this method and the results are reported of the application of the method to the examination of 570 samples of market milk.

The authors state in conclusion that "the application of the brom-cresol purple test is not to be regarded as final, but only as preliminary and suggestive. Its chief value is to be found in the fact that, when properly used, it will greatly minimize the work involved in official milk inspection, because it will point in most cases directly to the milks that are abnormal and, therefore, indicate which samples need further detailed work to confirm or disprove the suspicion aroused by the result of the preliminary test."

A method for the determination of the keeping quality of milk, J. C. Baker and L. L. Van Slyke (*Jour. Biol. Chem., 40 (1919), No. 2, pp. 373–382*).—The brom-cresol purple test noted above has been applied to measure quantitatively and relatively the keeping quality of milk. The technique of the method is the same, with the exception that the pipettes and test tubes used are sterilized before sampling the milk and that the samples are incubated for a given time at a temperature of from 18 to 20° C. The milk is examined for changes of color at 24-hour intervals. The main factor shown by the test in regard to the keeping quality of the milk is the development of acidity, four stages of progress being distinguishable from the grayish blue of normal milk to the final clear yellow of sour milk. A comparison of this test with the bacterial count of a large number of samples of market milk, both raw and pasteurized, is reported, indicating that in general large numbers of bacteria and increase of acidity are in fair correlation.

The test as applied also indicates other factors related to keeping quality, such as digestion, gas, alkali production, and abnormal odor and taste.

Some experiments on the differentiation of cow and buffalo milk, C. Todd (*Dept. Pub. Health Egypt, Rpts. and Notes Pub. Health Labs., No. 1 (1917), pp. 25–27*).—It has been found possible to differentiate cow's milk from buffalo milk by means of a precipitin reaction. The immunization of a cow with buffalo milk gives rise to precipitins for the milk of the buffalo and cow and to a less extent for that of the goat. By treatment of this immune serum with cow's milk the precipitins for the cow and goat may be removed, leaving the serum specific for buffalo milk.

Attempts to render the immune serum specific for the cow by treatment with buffalo milk were not successful, as this removed the precipitins for both animals. Immunization of the buffalo with cow's milk was also unsuccessful, as the amount of precipitin formed was excessively small.

Rapid method for the determination of moisture in margarins, L. Frank (*Chem. Ztg., 43 (1919), No. 65, pp. 314, 315, fig. 1; abs. in Chem. Abs., 13 (1919), No. 22, p. 2937*).—The author employs for the rapid determination of moisture in butter and margarins a balance similar to the Westphal balance, with which readings are taken of the melted sample before and after the moisture has been driven off by careful heating. The method is said to give slightly higher results than the ordinary gravimetric method.

The action of furfurol and dextrose on amino acids and protein hydrolysates, C. T. Dowell and P. Menaul (*Jour. Biol. Chem., 40 (1919), No. 1, pp. 131–136*).—A contribution to the question of the accuracy of the Van Slyke method of protein analysis as applied to feedstuffs is reported from the Oklahoma Experiment Station in a study of the action of furfurol and dextrose on certain amino acids and on protein hydrolysates representing both basic acids and nonamino acids.

Glycin did not react with furfurol, but a decrease in amino nitrogen was obtained when furfurol was boiled with tyrosin and cystin and with the hydrolysates of shrimp, casein, wool, and salmon. The greatest decrease in amino nitrogen was obtained when the reaction took place in a neutral or slightly acid medium. Similar results were obtained by boiling dextrose with protein hydrolysates in slightly acid solution. A loss of amino nitrogen also resulted when casein hydrolysates were boiled in 20 per cent hydrochloric acid for 15 hours in the presence of arabinose, gum arabic, starch, and cellulose.

The authors conclude that the method proposed by Eckstein and Grindley (E. S. R., 40, p. 510) for the analysis of feedstuffs by the Van Slyke method would lead to low results.

The determination of carbon monoxid in blood, D. D. Van Slyke and H. A. Salvesen (*Jour. Biol. Chem., 40 (1919), No. 1, pp. 103–107*).—The method described consists briefly in setting free the oxygen and carbon monoxid in the blood by the addition of ferricyanid, removing both gases with the help of a Torricellian vacuum in the Van Slyke apparatus for blood gas analysis, absorbing the oxygen by alkaline pyrogallate, and measuring the volume of residual carbon monoxid directly at atmospheric pressure.

The determination of blood volume by the carbon monoxid method, H. A. Salvesen (*Jour. Biol. Chem., 40 (1919), No. 1, pp. 109–125, figs. 2*).—

The method described in the paper noted above has been applied with success to determinations of the blood volume by the carbon monoxid method in 14 rabbits and 6 normal men.

A note on the determination of catalase in blood, M. Bodansky (*Jour. Biol. Chem., 40 (1919), No. 1, pp. 127–130, figs. 2*).—The author points out as one of the sources of error in catalase determinations, variations in the H-ion concentration of the hydrogen peroxid employed, the velocity of the reaction increasing as the acidity of the hydrogen peroxid is decreased and becoming greatest when the solution is slightly alkaline.

A microsaccharimeter, H. J. Van Lutsenburg Maas and G. Van Iterson, jr. (*K. Akad. Wetensch. Amsterdam, Verslag Wis en Natuurk. Afd., 24 (1915), pt. 1, pp. 251–263, pl. 1; also in* [*English Ed.*] *Proc. Sect. Sci., 18 (1915), pt. 1, pp. 258–269, pl. 1*).—A microsaccharimeter is described and illustrated, by means of which quantities of sugar of from 0.1 to 3.5 mg. may be used and a volume of 0.01 cc. is sufficient to perform the analysis. The time required for fermentation is much shorter than with the usual form of apparatus, six hours being sufficient for all carbohydrates with the possible exception of raffinose.

Crystal formation in supersaturated raw sugar solutions, P. J. H. Van Ginneken (*Chem. Weekbl., 16 (1919), No. 38, pp. 1210–1229, figs. 2*).—This is the report of a study of various factors influencing the formation of primary and secondary crystals in raw sugar solutions. Crystal formation is shown to be an autocatalytic phenomenon.

Crystallization of sugar from its aqueous solution, H. C. Prinsen-Geerligs (*La. Planter, 64 (1920), No. 2, pp. 30, 31*).—This discussion of the phenomena of retardation and acceleration in the crystallization of sugar consists principally of a review of the article by Van Ginneken, noted above.

The foaming of raw and refinery beet sugar juices, A. Herzfeld (*Ztschr. Ver. Deut. Zuckerindus., 1919, No. 760, II, pp. 207–214*).—The use of coal-tar oils in place of vegetable oils to reduce foaming, imperfect filtration of the juice on account of the poor quality of the filter employed, and the altered composition of frozen beets often used are mentioned as factors responsible for the unusual amount of foaming noted of late in German sugar beet factories.

Manufacture of Farina from potatoes, H. W. Richards (*Jour. Bd. Agr.* [*London*], *26 (1919), No. 7, pp. 700–703, pls. 3*).—This article deals with the production of potato flour or Farina, and the value of this industry to the farming interests in offering a steady market of wider scope than when supplying potatoes solely for table use and in producing valuable by-products in the potato residues which can be used as feeding stuffs. A brief discussion is given of the choice of varieties of potatoes for this industry, of the manufacturing process, and of the type of factory required.

Sucrose formation in the drying of potatoes, H. I. Waterman and H. C. A. Holleman (*Chem. Weekbl., 16 (1919), No. 38, pp. 1230, 1231*).—A brief report is given of a study of the effect of various factors on the formation of sugar in the drying of potatoes (E. S. R., 33, p. 661). It was found to be prevented by the use of whole potatoes instead of sliced potatoes, and also by a preliminary soaking of the sliced potatoes in alcohol. This is thought to indicate the extreme sensitiveness of the reaction.

Dehydration of vegetables: Past, present, and future, S. C. Prescott (*Potato Mag., 1 (1919), No. 9, pp. 6, 16, 17, 20–23, figs. 8*).—Essentially noted from another source (E. S. R., 40, p. 414).

Commercial dehydration: A factor in the solution of the international food problem, S. C. Prescott and L. D. Sweet (*Ann. Amer. Acad. Polit. and Soc. Sci., 83 (1919), No. 172, pp. 48–69*).—Essentially noted from another source (E. S. R., 40, p. 414).

The ripe olive process as used in California factories (*Fig and Olive Jour., 4 (1919), No. 7, p. 4*).—A detailed description is given of methods used by California packers in the processing of ripe olives from the tree to the can.

Principal researches on the production, utilization, and chemical composition of oil-producing fruits and seeds, H. JUMELLE (*Chim. et Indus.* [*Paris*], *2 (1919), No. 10, pp. 1168–1180*).—This is a brief review of the literature on the subject, covering the period of 1914 to 1917. The material is classified under the headings of liquid oil, special oils, and the machinery of the producing countries.

Possibility of commercial utilization of tomato seed and grape seed, J. H. SHRADER (*Jour. Indus. and Engin. Chem., 11 (1919), No. 12, pp. 1134, 1135*).—The author discusses, on the basis of data obtained from various waste-producing stations in the tomato pulping and grape juice industries, the possibilities of the commercial utilization of the canning house waste. The commercialization of such waste is thought to be profitable only by assembling the waste from readily accessible localities at some center and there extracting the oil. A greater profit is considered possible if the seeds are first separated from the other waste and then shipped to the central plant, and if the Cobwell system of grease recovery from garbage is used for the extraction of the oil.

Notes on the preservation of eggs, H. I. MACOMBER (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 5 (1919), No. 9, pp. 71, 72*).—In the course of an investigation of the value of different methods of treating eggs for preservation, particularly in cold storage, paraffin was found to have a decidedly detrimental effect on eggs. Treatment with oil or with vaseline apparently improved the quality, but spoiled the appearance of the eggs. Sealing eggs in fruit jars was found to be a poor method of preservation. Soap solution was as effective a preservative as water glass. Other sodium salts were ineffective.

METEOROLOGY.

Agriculture and weather forecasting, E. LOPEZ (*Mem. y. Rev. Soc. Cient. "Antonio Alzate," 37 (1919), No. 2, pp. 87–96, fig. 1*).—This article indicates how the weather forecasts of the Central Meteorological Service of Mexico may be used for the benefit of agriculture.

Periodicities in atmospheric pressure, J. LÉVINE (*Compt. Rend. Acad. Sci.* [*Paris*], *168 (1919), No. 11, pp. 566, 567, fig. 1; abs. in Sci. Abs., Sect. A-Phys., 22 (1919), No. 259, p. 313*).—The serial values of the lowest reading of the barometer at Paris for each year from 1700 to 1918 are shown in a diagram. From this it appears that there is a periodicity in low pressure of about 96 years, the low periods occurring during the years 1724–1739, 1821–1836, and 1916–1931(?)

A new general classification of climates, W. KÖPPEN (*Petermann's Mitt. Justus Perthes' Geogr. Anst., 64 (1918), Sept.-Oct., pp. 193–203; Nov.-Dec., pp. 243–248, pls. 2; abs. in Rev. Gén. Sci., 30 (1919), No. 19, pp. 550–553*).—A world classification with reference to temperature, precipitation, and time of year is described and explained in detail.

The climate of South Africa, H. E. WOOD (*Reprinted from So. African Geogr. Jour., 2 (1918), No. 1, pp. 5–8*).—The broad general conditions controlling or affecting climate in South Africa are briefly explained.

The mean annual temperature is very nearly the same over all parts of the South African Union. The variations of temperature are, however, much greater over the interior than in the coastal regions. Frosts are practically unknown near the coast, but occur frequently between May and September in the interior. At Capetown the average maximum shade temperature in January is 78.5° and the average minimum in July is 47.2°. At Kimberley, in the interior, the corresponding figures are 90.5° and 36.5°. The diurnal range of temperature at an interior station as compared with a coastal station is even more marked than this. Due to the influence of the warm Mozambique current flowing down the east coast of South Africa and the cold Benguela current flowing up the west coast, the temperatures along the east coast are higher than those along the west coast. Durban and Port Nolloth, in nearly the same latitude, have mean annual temperature of 70.8° and 75.5°, respectively. As a result of the influence of the Mozambique current, the climate of the coastal strip of Natal is tropical rather than semitropical.

Rainfall during the winter months is very limited and practically confined to the western part of the Cape. This is explained by the fact that the wind system over the Union in the winter months is such that the surface air tends to move outward and has a low moisture content. The northeasterly winds which prevail during the summer months are, however, better supplied with moisture, which is conveyed well into the interior. "The western half of the Union is on the whole much drier than the eastern half. The strip of land along the Natal coast has a rainfall of between 35 and 50 in. per annum, whereas the greater part of the Cape province, excepting the southwest and south coastal regions, only receives between 5 and 15 in. a year. . . .

"The summer rainfall over the interior of South Africa may be divided into two classes: (1) The steady rains, which are associated with northeasterly winds and a fairly steep pressure gradient, and (2) the thunder showers which occur with very shallow gradients. The steady rains can be forecasted, as they follow a well-marked distribution of pressure, but it is a very difficult matter to forecast by even a few hours the occurrence of thunderstorms. Thunderstorm conditions may exist over a huge area of country, but the actual falls of rain are very localized. . . .

"The great frequency of summer thunderstorms over South Africa is due partly to the intense solar radiation, and probably also partly to the generally bare character of the country. . . . Over the Witwatersrand district 56 per cent of the rainfall is contributed by heavy showers of over ½ in. in amount."

The amount and composition of rain falling at Rothamsted, E. J. RUSSELL and E. H. RICHARDS (*Jour. Agr. Sci. [England], 9 (1919), No. 4, pp. 309–337, figs. 4*).—This article supplements a previous paper by Miller, published in 1905 (E. S. R., 17, p. 533). The history of the Rothamsted investigations on this subject is briefly reviewed and the data obtained summarized.

It is shown that during the 60 years, 1853–1912, the average annual rainfall was 28.34 in. During the period 1888–1916 it was 28.82 in., and during the 14 years, 1903–1916, it was 29.98 in., indicating a progressive increase in rainfall. The four wettest months at Rothamsted are July, August, October, and November; the driest, February, March, April, and June.

In the period from 1888 to 1916, during which the rain water was analyzed, the average amount of ammoniacal nitrogen brought down by the rainfall was 0.405 part per million, equivalent to 2.64 lbs. per acre annually; nitric nitrogen 1.33 lbs.; and organic nitrogen 1.35 lbs. Since 1912 the relative proportion of nitric nitrogen has increased, so that it is now equal to the ammoniacal nitrogen instead of being only half as much. The reasons for this and other changes are discussed at some length. The yearly fluctuations in ammoniacal nitrogen have followed rainfall fairly closely. This was also true of nitric nitrogen until 1910, since when there has been no simple relationship. The rainfall of May, June, July, August, and October has been richer in ammoniacal and nitric nitrogen than that of January, February, March, and April.

The amount of chlorin brought down by the rainfall was 2.43 parts per million, equivalent to 16 lbs. per acre annually. There has been an increase in the amount of chlorin in the rain during the period of observation, 1877–1916. Its fluctuations closely follow rainfall.

"The marked difference in composition between summer and winter rainfall suggests that these may differ in their origin. The winter rain resembles Atlantic rain in its high chlorin and low ammonia and nitrate content. The summer rain is characterized by low chlorin but high ammonia and nitrate content, suggesting that it arises by evaporation of water from the soil and condensation at higher altitudes than in the case of winter rain. . . .

"Reasons are adduced for supposing that the ammonia arises from several sources. The sea, the soil, and city pollution may all contribute. Neither the sea nor city pollution seems able to account for all the phenomena; the soil is indicated as an important source by the fact that the ammonia content is high during periods of high biochemical activity in the soil, and low during periods of low biochemical activity. The close relationship between the amounts of ammoniacal and nitric nitrogen suggests either a common origin or the production of nitric compounds from ammonia."

The relation of irrigation to humidity in a recently reclaimed desert, E. A. McGregor (*Plant World, 22 (1919), No. 2, pp. 45–52, figs. 3*).—From a comparative study of humidity and irrigation data for the Imperial Valley, Cal., the author reaches the conclusion that the degree of atmospheric humidity is not directly influenced or controlled by the relative amount of water distributed over the land by irrigation. The seasonal humidity fluctuations are, in his opinion, to be accounted for through geographically far-reaching meteorological factors.

The cooling of the soil at night, with special reference to late spring frosts, T. B. Franklin (*Proc. Roy. Soc. Edinb., 39 (1918–19), No. 2, pp. 120–136, figs. 3*).—Observations on temperature and moisture in a garden soil consisting of a layer of loam rich in humus, about 6 in. deep, resting on a stony subsoil of quite different character, on calm clear nights during the winter (November to March) of 1918–19 are reported. These indicated that "(1) The radiation from the soil may be accounted for in counterbalancing the upward conduction and the latent heat of freezing—the residue only cooling the soil. (2) The rate of radiation of the soil on calm clear nights, when fifth magnitude stars are visible, is a function of the relative humidity. (3) Other causes such as condensation, evaporation, etc., have little effect on the temperature of the soil on calm clear nights. (4) The surface tends to fall rapidly such a number of degrees below the temperature of the 4-in. depth as will make the conduction from this depth balance the radiation; after this takes place the surface temperature can fall no faster than that of the 4-in. depth, and a sufficiently high temperature underground will obviously render a frost unlikely. (5) This temperature difference between the surface and the 4-in. depth, which makes the upward conduction balance the radiation, is probably about 10° F. during the winter, when the soil is almost invariably wet, and of uniform maximum conductivity from day to day, but may be as much as 20° after a dry spell in spring or early summer. (6) The prediction of frost on any given night depends on the possibility of assessing the value of the following: (*a*) Average relative humidity during the night, (*b*) the temperature of an assigned depth—say 4 in.—at the time of surface minimum, (*c*) the conductivity of the layer between the assigned depth and the surface, (*d*) the difference between the surface soil minimum and that of the air above it. (7) It might be possible, after an extended series of observations with a set of electrical resistance thermometers, to forecast the minimum temperature on calm clear nights from observations taken in the early afternoon."

By covering the earth with a layer of ashes or by putting a shelter over it, it was possible to keep the soil 10° warmer than in the open. Soil under natural moss and grass was also 10° warmer than open soil. Loose raked soil was 3° warmer than soil not so treated. Soil covered with manure was 6.5° warmer, and with cover of fallen leaves 7° warmer than uncovered soil. Warm rains also decidedly increased the temperature of the soil.

Wind, and the distribution of pathogenic soil organisms, H. G. MacMillan (*Phytopathology, 9 (1919), No. 10, pp. 471–473, pl. 1*).—The results of brief observations are set forth, from which it is considered probable that the wind is an active agent in the distribution and dissemination of organisms present in the soil and pathogenic to field and truck crops.

SOILS—FERTILIZERS.

A quantitative relation between soil and the soil solution brought out by freezing-point determinations, B. A. Keen (*Jour. Agr. Sci.* [*England*], *9 (1919), No. 4, pp. 400–415, figs. 4*).—The author gives a critical discussion of some of the data obtained by Bouyoucos and his associates in their work on the subject at the Michigan Experiment Station, comparing results obtained in some cases and conclusions with his own work.

With reference to the finding of Bouyoucos that the soil solution in quartz sand and extreme types of sandy soil obeys approximately the same law as dilute solutions in which the freezing-point depression varies as the concentration or inversely as the moisture content, and with reference to the reconciliation of this behavior by Bouyoucos on the assumption that some of the water is rendered unfree in the sense that it does not take part in the depression of the freezing point, it is shown that "the water rendered unfree is not a constant amount, but varies with the total moisture content. A definite relation exists between the free, unfree, and total moisture, expressed by the equations:

$$(1)\ Y_n = {}_cM_n,\ \text{and}\ (2)\ Z_n = \frac{1}{\frac{1}{c^x}}\, Y_n\frac{1}{x} - Y_n,$$

where c and x are constants for any one soil, M_n=total moisture content, Y_n= free water, and Z_n=unfree water. The proportion of free to total water continually decreases and that of unfree to total continually increases as the total moisture diminishes in amount over the experimental range.

"The actual amount of free water continually decreases as the total moisture diminishes, but it can not be definitely stated at present how the actual amount of unfree water changes as total moisture diminishes. The uncertainty is due to the presence of an unknown (but constant) factor in the constant '*c*' of the equation, viz, the quantity of free water present at the highest amount of total water used in the experiments of Bouyoucos. According to the value arbitrarily assigned to this quantity, so the amount of unfree water may continually decrease with decrease of total moisture over the experimental range, or may increase to a maximum and then decrease. It is probable that the former is more truly representative of the actual condition in soil, although the possibility of a maximum occurring in the amount of unfree water is suggestive in any consideration of the 'optimum-moisture-content,' and the passage . . . of various physical properties through a maximum or minimum value at that point."

It is concluded with reference to the relations existing between the soil and its moisture content that "soil colloids must be considered as primarily concerned in the relations. The water present is subjected to the same law over the whole experimental range, and the various constant and critical points shown by soil at varying degrees of water contents are approximate equilibrium values only and do not indicate any break or abrupt change in the physical condition of the soil moisture."

A note on the capillary rise of water in soils, B. A. Keen (*Jour. Agr. Sci. [England], 9 (1919), No. 4, pp. 396–399*).—A simple, direct calculation of the capillary rise of water in soils is given, resulting in the formula $h=\frac{0.75}{r}$, in which h=height of capillary rise and r=the radius of soil particles. This calculation is based on the assumption that "if the soil grains are taken as spherical, of one size, and packed in the closest possible manner, then the pore space may be regarded as consisting of capillary tubes having an approximately triangular cross section." It is thought that the results obtained with this formula may be taken as the probable maximum values for capillary rise.

Soil acidity: The resultant of chemical phenomena, H. A. Noyes (*Jour. Indus. and Engin. Chem., 11 (1919), No. 11, pp. 1040–1049, fig. 1*).—Soil acidity is discussed in relation to the place of the metals ordinarily occurring in soils in the electromotive series, the differences in the hydrolysis of the salts used in different soil acidity methods and the conditions under which water may act as an acid or a base. The presence of free H-ions in the soil solution is accounted for on the basis of hydrolysis. Physicochemical explanations of the hydrolysis of silicates and of organic matter and the ability of organic matter to form complex ions with bases are held to be more satisfactory explanations of the rôle of organic matter than "adsorption" theories. Experiments conducted at the Purdue Experiment Station on the extraction of the water-soluble material in soils are reported, and the extraction apparatus is described.

Carbon dioxid gas, added to the soil, in every case increased soil acidity by the Hopkins potassium-nitrate method. Calcium carbonate decreased the acidity of the soil but not in proportion to the amounts added, showing that this compound made other chemical combinations beside those which decrease the acidity measured by the Hopkins method. Calcium carbonate also produced chemical changes in the soil that were shown by the differences in acidity before and after extraction with conductivity water. There was a 58-lb. decrease due to extraction where no lime was applied, an increase of 16 lbs. on extraction where the single application of lime was made, and an increase of 25 lbs. on extraction where the double application of calcium carbonate was made. The form in which the phosphorus was applied and both the form and the amounts in which the nitrogen was applied effected changes in the soil, which were apparent when the soil was treated with normal potassium-nitrate solution. Carbon-dioxid-gas additions to the soil changed the amounts of substances precipitable by ammonium hydroxid which are extracted by a normal potassium-nitrate solution. Calcium-carbonate additions to the soil did not decrease the weights of ammonium-hydroxid precipitable material in proportion as they decreased the acidity results, and had comparatively little effect on the conductivities of the soil extracts. Phosphorus and nitrogen applied in different forms were the cause of water extracts of very different specific conductivities. The extracts from the soils which had received dicalcium and calcium carbonate had low specific conductivities in comparison to the extracts from soil which received sodium nitrate or acid phosphate.

It is generally concluded that "the reaction of a soil at any time is dependent both on the nature of and the proportions in which its constituents are present with water. Changing the water content, removing substances from solution, and the addition of other substances change the reaction in accord with the working of the law of mass action. The solubilities of substances in, the possibilities of combination, and the rate at which reactions take place in soil vary so that the condition of a soil at any time can be considered but a stage in its progress toward a constantly shifting equilibrium in accordance with the principle of Le Chatelier."

A preliminary note on soil acidity, O. B. WINTER (*Science, n. ser., 51 (1920), No. 1305, pp. 18, 19, fig. 1*).—Studies of the water extracts of soils and various soil-forming mineral materials showed that some of these materials, when leached with water containing carbon dioxid, make soils acid. Determinations of the hydrogen-ion concentration of neutral water extracts of the materials and of similar extracts, after different known quantities of standard calcium hydroxid had been added, indicated "that there are some dissociated acids or acid salts present in the solutions of acid soils, and of the decomposition products; and that with all of the materials some of the calcium hydroxid is entirely removed from the field of action."

The intensive formation of nitrates by biochemical methods, E. DUBOURG (*Proc. Verb. Soc. Sci. Phys. et Nat. Bordeaux, 1917–18, pp. 51–65*).—The results of studies by others bearing on the subject are reviewed to illustrate the biological process of soil nitrification.

Observations on soil protozoa, D. W. CUTLER (*Jour. Agr. Sci. [England], 9 (1919), No. 4, pp. 430–444, fig. 1*).—Studies on a direct method for counting protozoa and on factors concerned in the relationship between protozoa and the soil are reported.

It was found that "the direct counting method for soil protozoa devised by Kopeloff and Coleman [E. S. R., 33, p. 809] for use in liquid media gives results entirely comparable with those obtained by a dilution method. The factors governing the relation between the protozoa and the soil particles are those of surface action, and the capacity of various substances, sand, soil, and clay, for retaining these organisms is specific and constant. Coarse sand is capable of withdrawing per gram approximately 145,000 amœbæ and flagellates per cubic centimeter from a suspension of any strength. Fine sand withdraws approximately 980,000 per cubic centimeter, soil and partially sterilized soil 1,650,000, ignited soil 1,500,000, and clay 2,450,000. These figures are constant for given material and organisms, and are independent of the concentration of the suspension, the time of action, or whether the suspension contains cysts or active forms of the amœbæ and flagellates investigated. Also the action is the same when the experiment is performed with a suspension of living or dead organisms.

"Experiments with the ciliate *Colpoda cucullus* show that coarse sand per gram retains 27,000 per cubic centimeter, fine sand per gram 185,000 per cubic centimeter, soil and partially sterilized soil 280,000 per cubic centimeter, ignited soil 270,000 per cubic centimeter, and clay 450,000 per cubic centimeter."

Analyses of soils of Crisp County, W. A. WORSHAM, JR., ET AL. (*Ga. State Col. Agr. Bul. 181 (1919), pp. 30, pl. 1, figs. 5*).—This bulletin reports and discusses analyses of the soils of an area of 173,440 acres in southwestern Georgia.

It is shown that the principal upland soils of Crisp County are markedly deficient in nitrogen, phosphoric acid, and potash, the nitrogen being apparently relatively in minimum. Some of the soils are also in need of lime and deep plowing.

Manures and manuring, W. H. Harrison (*Ann. Rpt. Bd. Sci. Advice India, 1917–18, pp. 6, 7*).—Experiments relating to the effect of green manure on soil, while not complete, have indicated that "(1) ordinarily there is no appreciable permanent enrichment of the soil in nitrogen, (2) a small portion of the nitrogen is lost as ammonia during the first month after application and the loss by seepage into the lower strata does not appear to be considerable . . . and (3) the application of either calcic or dolomitic limestone favors nitrification and humus formation and leads to better yields both of the green-manure crop and the subsequent crop of ragi."

Pot-culture experiments, 1918, J. A. Voelcker (*Woburn Expt. Sta. Roy. Agr. Soc. England Rpt., 1918, pp. 17–24, pl. 1*).—Experiments on the influence of magnetic iron oxid, ferric oxid, and ferrous and ferric sulphate, chlorids, and sulphids, on wheat on heavy rich soil indicated that "iron compounds, with the exception of the chlorids, show singularly little influence either way upon the wheat crop. The magnetic oxid has a slightly stimulating influence. Ferrous chlorid has a markedly beneficial effect when not exceeding 0.1 per cent of iron in the soil, but if beyond this has a markedly harmful influence. Ferric chlorid is decidedly toxic, and, if present to 0.2 per cent iron in the soil, will entirely prevent growth."

Experiments on light sandy soil to determine the best time for the application of ammonium sulphate to wheat showed that there was little choice between the different modes of application, and that even on light soil there was little loss by winter application. On the whole, the best results were obtained by dividing the application between autumn and spring.

Experiments with wheat on a soil deficient in lime, on the relative value of superphosphate, basic superphosphate, basic slag, ground Florida pebble phosphate, ground Gafsa phosphate, steamed bone flour, and plain calcium carbonate showed that "practically as high a return as any was that from the use of carbonate of lime alone (the amount of lime applied being equivalent to that in the richest phosphate). The experiment, as a test of the relative phosphates, was an absolute failure, the one outstanding fact being that it was the lime contained and not the phosphate that caused any increase."

Studies of the inability of "Down" land which had never been arable to produce clover crops when plowed showed that this was primarily due to a deficiency in potash.

Artificial manures.—Experiments on their value for crops in western India, II, H. H. Mann and S. R. Paranjpe (*Dept. Agr. Bombay Bul. 89 (1918), pp. 33*).—This describes the continuation of work along the same general lines as previously noted (E. S. R., 37, p. 215).

Artificial fertilizers in Japan, E. R. Dickover (*U. S. Dept. Com., Com. Rpts., No. 82 (1919), pp. 179–182*).—In a general review of the artificial fertilizer situation in Japan, it is stated that oil cake of various kinds is the most important type of fertilizer produced and used in Japan. The production of oil cake amounts to about $10,000,000 annually. The principal chemical fertilizers produced are superphosphate and ammonium sulphate, although the production of the latter is insufficient to meet the demand. "The local production of superphosphate is estimated at 500,000 tons and of sulphate of ammonia at 55,000 tons, while the normal annual imports of sulphate of ammonia are about 15,000 tons. Deducting the yearly exports of about 28,000 tons, the total consumption of chemical fertilizers in Japan reaches a total of 600,000 tons."

Limestone and phosphate (*Springfield: Ill. Farmers' Inst., 1919, pp. 31, figs. 3*).—This is a collection of statements regarding practical experience in the use of limestone and phosphate on soils as made at the twenty-fourth annual meeting of the Illinois Farmers' Institute, at Joliet, Ill., in February, 1919.

A report on the retail prices of nitrate of soda and acid phosphate as of May 1, 1919 (*U. S. Dept. Agr., Dept. Circ. 39* (*1919*), *pp. 15*).—Tabulated statistics are presented showing the wholesale prices of nitrate of soda and acid phosphate at New York from January 1 to May 1, 1919, together with a partial report of the retail prices by districts, States, and counties in May as reported by county agents. Differences in retail prices were found to vary considerably between States and regions and widely between counties in the same State, amounting to more than 100 per cent in some instances.

Saltpeter in Guatemala, H. S. GALE (*Engin. and Min. Jour.*, *107* (*1919*), *No. 24, pp. 1025–1031, figs. 6*).—This is a description of the primitive methods employed in Guatemala for utilizing saline efflorescences containing more or less potassium nitrate. These leachings are from soils about the native villages. Analyses of samples of the soils showed that the surface materials contain 6.72 per cent of soluble salts; and the first 6 in. below the surface, 1.42 per cent.

The fixation of atmospheric nitrogen and the manufacture of synthetic nitrogenous products (*Indus. Chim.* [*Paris*], *6* (*1919*), *No. 68, pp. 266–268, fig. 1*).—A diagram is presented showing the different processes of the synthesis of nitric acid and ammonia, using atmospheric nitrogen, together with a brief description of each process, the purpose being to summarize briefly the whole subject of atmospheric nitrogen fixation. A list of 29 references to literature bearing on the subject is included.

The manufacture of nitrates by electrothermic oxidation of nitrogen, M. VÈZES (*Proc. Verb. Soc. Sci. Phys. et Nat. Bordeaux, 1917–18, pp. 66–79, figs. 3*).—This is a description of the reactions involved in the manufacture of nitric acid by oxidation of nitrogen with the electric arc.

The manufacture of nitrates by electrothermic oxidation of nitrogen, A. RICHARD (*Proc. Verb. Soc. Sci. Phys. et Nat. Bordeaux, 1917–18, pp. 79–90, figs. 3*).—Processes and equipment are briefly described.

The synthesis of ammonia, M. VÈZES (*Proc. Verb. Soc. Sci. Phys. et Nat. Bordeaux, 1917–18, pp. 91–101, figs. 4*).—The reactions involved are described, and their theory discussed.

The synthesis of ammonia and its transformation into nitric acid, A. RICHARD (*Proc. Verb. Soc. Sci. Phys. et Nat. Bordeaux, 1917–18, pp. 102–115, fig. 1*).—Processes are described.

Further contribution to knowledge of the action of ammonium salts in plant physiology, H. G. SÖDERBAUM (*Meddel. Centralanst. Försöksv. Jordbruksomrâdet, No. 156* (*1917*), *pp. 29, figs. 3; abs. in Zentbl. Agr. Chem.*, *48* (*1919*), *No. 4, pp. 133–135; Jour. Soc. Chem. Indus.*, *38* (*1919*), *No. 14, pp. 507A*).—In studies of ammonium salts to determine whether the cation or the anion is the injurious factor for certain plants, it was found that ammonium sulphate, chlorid, phosphate, nitrate, and carbonate showed more or less toxicity when added to pot cultures of barley on sand soil. The chlorid was the most toxic, followed in order by the sulphate, nitrate, and carbonate, while the phosphate produced a slight increase. It is concluded that the toxicity is mainly due to the ammonium ion.

Further experiments to determine the limits of toxicity of ammonium sulphate for rye, wheat, oats, and barley showed the approximate limits to be for rye about 178 lbs. nitrogen per acre, for wheat less than 44.5 lbs., for oats between 89 and 133.5 lbs., and for barley less than 22 lbs. nitrogen per acre.

Potato plants were found to be very resistant to ammonium sulphate. The optimum amount appeared to be about 178 lbs. of nitrogen per acre, but additions of 267 lbs. of nitrogen per acre worked no extraordinary injury.

Phosphatic fertilizers, O. F. F. Nicola (*Univ. Nac. Buenos Aires, Rev. Facult. Agron. y Vet., 2 (1919), No. 2, pp. 190–224*).—This is a rather extensive treatise on the processes of fixation and assimilation of phosphoric acid in the soil, the treatment of rock phosphate with acid sodium sulphate, the action of different lime and magnesia salts on the solubility of phosphoric acid, and the biochemic-cycle of phosphorus in the soil.

The phosphate requirements of some Lower Burma paddy soils, F. J. Warth and Maung Po Shin (*Mem. Dept. Agr. India, Chem. Ser., 5 (1919), No. 5, pp. 131–155, pls. 9*).—Analyses and pot culture tests of paddy soils are reported. The pot culture tests were manurial trials to determine the effect of phosphoric acid and nitrogen separately and combined.

By using ammonium sulphate as a source of nitrogen, pot cultures yielded striking results which clearly differentiated soils lacking in phosphoric acid from those well supplied with phosphoric acid. The phosphoric acid content necessary to produce satisfactory crops was found to be somewhat lower than the amount usually considered necessary.

"The lack of phosphoric acid is by no means general all over Lower Burma. It is serious only within definite areas. The available phosphate supplies of the Province will therefore meet the want more easily than it was feared might be the case. The soil nitrogen in these soils is far from readily available. This seems to be more particularly true of the soils poor in phosphoric acid. The lack of available nitrogen is so serious that phosphoric acid manuring can not increase crop yields on soils poor in phosphoric acid. It is possible that the vegetation produced during the early rains is sufficient to act as a green manure, thus making the nitrogen more readily available."

The occurrence of natural phosphate in Switzerland and its agricultural use, E. Truninger (*Landw. Jahrb. Schweiz, 33 (1919), No. 3, pp. 288–312*).—This is a report of a geological and chemical survey of the phosphate resources of Switzerland, together with the preliminary results of some fertilizer experiments.

It is concluded that the only promising source of mineral phosphate lies in small phosphorite beds in the neighborhood of Buchs-Werdenberg. It is estimated that there is available only about 20,000 tons of phosphoric acid in these beds, owing to their limited extent and the hardness of the rock. The chemical treatment of this rock is not considered feasible. Fertilizer experiments with this rock phosphate added in finely ground condition left considerable doubt as to its fertilizing value.

Phosphate rock in Morocco (*Jour. Bd. Agr. [London], 26 (1919), No. 6, pp. 627, 628*).—Attention is called to the recent discovery of extensive deposits of phosphate rock at El Beroudj in French Morocco. It is stated that preliminary investigations indicate that the deposits may contain more than 1,000,000,000 tons of phosphate. Samples which have been analyzed show about 65 per cent phosphate.

The potash industry of the United States and its possibilities for future production, A. E. Wells (*Amer. Fert., 51 (1919), No. 9, pp. 63, 64, 87, 90, 92, 94, 100, 102, 104, 106, 110, 112, 114, 116, 121*).—This is a discussion of the present and possible future production of potash on a commercial scale in the United States from saline lakes, silicate rocks, alunite, kelp and organic sources other than kelp, and as a by-product from cement kilns and the iron blast furnace.

It is considered evident that during the next three or four years, at least, the production of potash from the saline lakes will continue to be the greatest source of production. "The total production of available potash which can confidently be expected during the next two years, if steps are taken to assure a market at a price of at least $2 per unit, is estimated at about 125,000 tons, obtained about as follows: From saline lakes, Nebraska, 55,000; California, 50,000; organic sources (waste molasses, beet sugar waste, wood ashes), 6,000; cement industry, 8,000; from blast furnace industry, 1,000; and special types of silicate rocks and alunite, 6,000."

Potash recovery at cement plants, A. W. G. WILSON (*Chem. Age [London], 1 (1919), Nos. 16, pp. 437–439; 17, pp. 462–464, figs. 4*).—This is a report of an investigation into the methods and cost of potash recovery at cement plants in the United States, made by the author for the Canadian War Trade Board. At present 15 cement plants in the United States have installed or are installing potash-recovery equipment. Methods and equipment are described.

Potash fertilizer experiments in 1916 and 1917 (*Ztschr. Landw. Kammer Braunschweig, 87 (1918), No. 6, pp. 47–50*).—Experiments with sugar beets on permeable loamy sand soil and with oats on relatively impermeable humus sand soil, to which potash was added alone and in different mixtures with nitrogen and phosphoric acid, are reported.

It was found that potash when added alone had only a small effect as far as total yield was concerned, but with the oats it markedly increased the proportion of grain to straw. Nitrogen alone had a much greater effect than potash alone, and better general results in total yield were obtained with combinations of two or three fertilizers.

Fertilizer experiments with potash lime [kalikalk], H. G. SÖDERBAUM (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 163 (1918), pp. 9; also in K. Landtbr. Akad. Handl. och Tidskr., 57 (1918), No. 1, pp. 29–35; abs. in Zentbl. Agr. Chem., 48 (1919), No. 4, pp. 135, 136; Jour. Soc. Chem. Indus., 38 (1919), No. 14, p. 507A; Jour. Chem. Soc. [London], 116 (1919), No. 681, I, p. 376*).—Kalikalk is a product prepared from potash, feldspar, limestone, and gypsum, and contains from 5.4 to 5.8 per cent potassium and from 32 to 34.4 per cent lime. Comparative tests with potassium sulphate on oats in pot cultures on moor soil indicated that the kalikalk produced somewhat the better results.

Gypsum, R. W. STONE (*U. S. Geol. Survey, Min. Resources U. S., 1918, pt. 2, pp. II+283–298*).—This reports data on the production, use, imports, and exports of gypsum in the United States during 1918, together with brief but similar information for Canada.

Nearly 24 per cent less gypsum was mined in the United States in 1918 than in 1917, owing to a reduction in building operations. On the other hand, the total value of the crude and calcined gypsum produced in 1918 surpassed that of any other year.

Sulphur as a fertilizer for alfalfa in southern Oregon, F. C. REIMER and H. V. TARTAR (*Oregon Sta. Bul. 163 (1919), pp. 5–40, figs. 9*).—The results of various preliminary experiments are reported, which indicated that sulphur in various forms had a favorable influence on certain crops, especially alfalfa. Further experiments conducted from 1915 to 1918, inclusive, on various types of soil showed that the alfalfa and clover crop can be increased from 50 to 1,000 per cent on many soils by the use of various fertilizers containing sulphur. These soils, included very diverse types, ranging from the coarse granite soils to the heaviest adobes, were well supplied with potassium, calcium, magnesium, and iron, but contained only limited amounts of sulphur. The following fertilizers, containing sulphur, produced similar beneficial results: Flowers of sulphur, superphosphate, gypsum, iron sulphate, sulphate of ammonia, sulphate of potash, sulphate of magnesium, and sodium sulphate. On these soils applications of sodium nitrate, monocalcic phosphate, potassium muriate, and lime had little or no effect on alfalfa. "It is apparent from this that the beneficial results obtained from the various sulphur fertilizers can not be attributed to any extent to any effect such fertilizers may have in liberating phosphorus, potassium, or lime in the soil, or on nitrification."

Better results were obtained the first season, where the sulphur was applied to the soil in the fall or early winter, than where applied in the spring. The first season the gypsum and other sulphate fertilizers usually gave better results than flowers of sulphur if applied in quantities supplying equal amounts of sulphur. The second season there was little or no difference in the yield. The various sulphur fertilizers had a very stimulative effect on the root system, increasing its size and the number of nodules.

Analyses made of the alfalfa plant grown under local conditions from fertilized and unfertilized plats showed that the fertilized plants contained more sulphur, more protein, and more nitrogen than the unfertilized plants. Alfalfa hay grown under local conditions did not contain as much sulphur as that in the Middle Western States. The amount in alfalfa hay from fertilized plats varied from 3.34 to 4.54 lbs. of sulphur to the ton, and in the hay from the unfertilized plats from 2.36 to 2.54 lbs. In the hay from the fertilized plats, from 71 to 79 per cent of the sulphur was in organic form, the remainder in sulphate form, while in the hay from the unfertilized plats all the sulphur was in organic form. Up to the present time gypsum has given as good results on most of the soils as superphosphate. Since the phosphorus content of many of these soils is rather low, it is considered probable that the superphosphate will eventually give better results than gypsum.

"On most all of the soils in southern Oregon an annual application on alfalfa of 200 lbs. of gypsum, or 250 lbs. of superphosphate, or 40 to 50 lbs. of sulphur and 200 lbs. of rock phosphate, will prove highly profitable. The latter combination will supply both sulphur and phosphorus most economically. Sulphur should not be used by itself on soils deficient in lime, as it will cause soil acidity. On such soils it should be used only in conjunction with liberal quantities of lime or rock phosphate."

Fertilizing action of sulphur on grapes, J. Chauzit (*Compt. Rend. Acad. Agr. France, 5 (1919), No. 32, pp. 835–837*).—Experiments are reported in which sulphur was added to soil growing grapes at the rate of 178 lbs. per acre, either alone or with horse manure at the rate of 28,480 lbs. per acre. Where the sulphur was added alone, crop increases of 19.2 per cent and 32.7 per cent were obtained. Where horse manure was added alone there was a decrease in crop, but when added with sulphur crop increases of 25.03 and 27.3 per cent were obtained.

It is concluded that sulphur has a definite fertilizing action and that it also hastens the decomposition of the manure.

Ten years' fertilizer experiments with manganese compounds and other stimulants, 1908–1917, H. G. Söderbaum (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 166 (1918), pp. 20; abs. in Zentbl. Agr. Chem., 48 (1919), No. 4, pp. 136, 137; Jour. Soc. Chem. Indus., 38 (1919), No. 14, pp. 507A, 508A*).—Pot culture experiments with oats, peas, and beans are reported, to study the stimulating action of such manganese compounds as manganese sulphate, manganese carbonate, pyrolusite, hydrated manganese peroxid, ferromanganese slag, and other stimulants such as calcium fluorid, potassium iodid, radioactive fertilizer, uranium acetate, and ferric hydroxid.

Out of 17 series of tests, manganese carbonate used in conjunction with aluminum sulphate on oats gave the only good results. The other materials were usually without effect. Uranium salts had an injurious action when added in large amounts.

The action of fluorids on vegetation, A. GAUTIER and P. CLAUSMANN (*Prog. Agr. et Vitic. (Ed. l'Est-Centre), 40 (1919), No. 33, pp. 153–158*).—Plat experiments on siliceous clay soils containing little lime, with calcium fluorid added in amounts equivalent to 100 mg. of fluorin per kilogram of soil, to clover, oats, carrots, potatoes, beets, cabbage, beans, poppies, barley, peas, turnips, mustard, leeks and other crops are reported.

A marked increase was obtained in a number of the crops particularly the more valuable crops, such as clover, oats, carrots, cabbage, peas, potatoes, etc., and at least a slight increase was obtained in the majority of the crops. A few of the crops did not respond to this treatment, such as rye, barley, buckwheat, kidney beans, and mustard; and beets, onions, and turnips were apparently slightly injured. In the majority of cases the residual effect the second year of calcium fluorid treatment was either small or negative.

Engine wastes: The cachaza and cinders, M. CALVINO (*Estac. Expt. Agron. Cuba Bol. 40 (1918), pp. 39*).—This bulletin reports and discusses analyses of 232 samples of by-products of the sugar industry, including 98 samples of cachaza or filter press waste, 59 samples of bagasse, and 75 samples of furnace cinders with special reference to their value as sources of fertilizing materials.

It was found that the bagasse contained a notable amount of potash, much greater than that in the cinders or press waste. The bagasse contained from 4.35 to 19.47 per cent of soluble potash, the cinders from 1 to 10.67 per cent, and the press waste from 0.42 to 0.84 per cent when fresh and from 1.13 to 2.5 per cent when dry. The press waste contained from 1.63 to 3.04 per cent total nitrogen and from 10 to 14 per cent lime.

Commercial fertilizers, P. L. HIBBARD (*California Sta. Bul. 315 (1919), pp. 197–227*).—This bulletin reports the results of actual and guarantied analyses and valuations of 217 samples of fertilizers and fertilizing materials collected for inspection in California during the fiscal year ended June 30, 1919. Of the total number of valuations reported, 32 per cent were below the amount guarantied.

Commercial fertilizers, 1919, C. D. WOODS (*Maine Sta. Off. Insp. 93 (1919), pp. 61–88*).—This bulletin briefly reviews the Maine fertilizer law, and reports the results of actual and guarantied analyses of 283 samples of fertilizers and fertilizing materials collected for inspection in Maine for the year 1919.

Fertilizer analyses (*Md. State Col. Agr. Quart., No. 83 (1919), pp. 32*).—This contains the results of actual and guarantied analyses and valuations of 348 samples of fertilizers and fertilizing materials offered for sale in Maryland from August, 1918, to January, 1919, inclusive. A table of registrations for 1919 under the new fertilizer law is also included.

Analyses of fertilizers: Fall season, 1918 (*Bul. N. C. Dept. Agr., 40 (1919), No. 254, sup., pp. 10+1*).—This bulletin contains the results of analyses and valuations of 145 samples of fertilizers and fertilizing materials collected for inspection in North Carolina during the fall season of 1918.

The National Fertilizer Association: A history of its organization and growth, 1894–1918 (*[Baltimore]: Natl. Fert. Assoc., 1918, pp. 42, figs. 3*).—This is a brief history of the National Fertilizer Association, consisting of a chronology of conventions and other important events.

AGRICULTURAL BOTANY.

Flora of the District of Columbia and vicinity, A. S. HITCHCOCK and P. C. STANDLEY (*U. S. Natl. Mus., Contrib. Natl. Herbarium, 21 (1919), pp. 329, pls. 42*).—In this publication the authors give keys to the families, genera, and species of plants found in the District of Columbia and vicinity.

Phytogeography of the eastern mountain-front in Colorado.—I, Physical geography and distribution of vegetation, A. G. Vestal (*Bot. Gaz.*, *68* (*1919*), *No. 3*, *pp. 153–193*, *figs. 17*).—The present article deals more particularly with geographic description and relations.

The genus Homalium in America, S. F. Blake (*U. S. Natl. Mus.*, *Contrib. Natl. Herbarium*, *20* (*1919*), *pt. 7*, *pp. 221–235*).—Description is given of 11 new species known to occur in South and Central America, and in Mexico.

New South American spermatophytes collected by H. M. Curran, S. F. Blake (*U. S. Natl. Mus.*, *Contrib. Natl. Herbarium*, *20* (*1919*), *pt. 7*, *pp. 237–245*).—Descriptions are given of a number of new species of plants collected by H. M. Curran in the State of Bahia, Brazil, and in the Department of Bolivar, Colombia.

Anatomical studies on littoral plants of Madagascar, M. Denis (*Rev. Gén. Bot.*, *31* (*1919*), *Nos. 362*, *pp. 33–52*, *figs. 5*; *363*, *pp. 115–120*, *figs. 3*; *364*, *pp. 129–142*, *figs. 4*).—This is an account of a study of the anatomical characters of a number of plants peculiar to the sands of the east coast of Madagascar, regarding which but little work has been recorded previously. Such plants show almost complete absence of epidermal protection. Other features related to ecological factors are noted.

A unifoliolate mutation in the adzuki bean, A. F. Blakeslee (*Jour. Heredity*, *10* (*1919*), *No. 4*, *pp. 153–155*, *fig. 1*).—Facts noted in connection with a unifoliolate habit in a specimen of the adzuki bean (*Phaseolus angularis*) are considered to show that this condition is of rare occurrence. This fact indicates that it is genotypic in nature and not a modification introduced by environmental factors.

The problem of heterostyly, G. Tischler (*Biol. Zentbl.*, *38* (*1918*), *No. 11*, *pp. 461–479*).—This is a bibliographical discussion of observation and opinion regarding heterostyly.

A biochemic basis for the study of problems of taxonomy, heredity, evolution, etc., with especial reference to the starches and tissues of parent-stocks and hybrid-stocks and the starches and hemoglobins of varieties, species, and genera, E. T. Reichert (*Carnegie Inst. Wash. Pub. 270* (*1919*), *pts. 1*, *pp. XI+376*, *pls. 34*, *figs. 820*; *2*, *pp. VII+377–834*).—This memoir supplements that previously noted (E. S. R., 31, p. 804). It consists largely of detailed reports of studies of parent stocks and their hybirds, and the results obtained are considered to be of broad application in biology. Special studies were made of Amaryllis and Brunsvigia and many of their reputed hybrids. The data obtained in these studies are supplemented by investigations made of many other genera, species, and hybrids. The histological properties and qualitative polariscope and iodin reactions of the parents are compared, and then those of the hybrid with those of the parents, and when there are two hybrids of the same parentage their properties are compared. Much attention was given to the study of qualitative reactions with several reagents, and the reactions have been found to be of importance not only in the studies of the starches of different varieties, species, and genera, but also of starches of parents and hybrids.

Studies in the physiology of the fungi, VI–X (*Ann. Missouri Bot. Gard.*, *6* (*1919*), *Nos. 2*, *pp. 93–142*; *3*, *pp. 183–222*, *pl. 1*, *figs. 5*).—These numbers complete the series previously noted (E. S. R., 38, p. 524), concluding with a bibliography.

VI. *The relation of bacteria to cellulose fermentation induced by fungi, with special reference to the decay of wood*, H. Schmitz (pp. 93–136).—The author has found that wood sterilized by autoclaving undergoes certain changes which must be considered when using wood for experimental purposes with wood-decaying fungi. Among these are changes in color, increase in the amount of reducing substances, in the acidity, and in the H-ion concentration of the extract, and change in resistance toward decay. Cellulose-dissolving bacteria play no important part in the decay of wood under natural conditions. The rate of decay may be materially increased by the ordinary saprophytic bacteria. The influence of bacteria on the rate of decay caused by fungi varies with different fungi on different woods.

VII. *Growth of wood-destroying fungi on liquid media*, S. M. Zeller, H. Schmitz, and B. M. Duggar (pp. 137–142).—The authors found that many wood-destroying fungi are not suitable for growth experiments with liquid media. It was found that *Merulius pinastri*, *Polyporus lucidus*, *Polystictus versicolor*, *Pleurotus sapidus*, and *Trametes peckii* grow best in the order named on the media employed. *Lenzites vialis*, *Dædalea quercina* and *M. lacrymans* grow satisfactorily on Richards' solution. It is considered desirable to select a specific medium for each fungus. H-ion concentration does not seem to be the limiting factor in growth, nor does it appear to be the factor which determines a desirable medium. The shifting of the H-ion concentration due to metabolism depends upon both the fungus and the medium. No general statement can be made concerning the relation between the H-ion concentrations of the culture media and the growth of wood-destroying fungi as a group.

VIII. *Mixed cultures*, S. M. Zeller and H. Schmitz (pp. 183–192).—Details and tabular results are given of work with mixed cultures of a number of fungi.

IX. *Enzym action in Armillaria mellea, Dædalea confragosa, and Polyporus lucidus*, H. Schmitz and S. M. Zeller (pp. 193–200).—The authors indicate several enzyms for each of the fungi, *P. lucidus*, *A. mellea*, and *D. confragosa*. A new method for the determination of ammonia liberated by amidase is described, this method involving the application of the indicator method for H-ion concentration determination.

X. *Germination of the spores of certain fungi in relation to hydrogen-ion concentration*, R. W. Webb (pp. 201–222).—From the work here reported it has been concluded that in the culture solution consisting of M/5 mannite, phosphoric acid, and sodium hydroxid, successively increasing concentrations of H-ions from neutral or approximately neutral to pH 3.1 to 2.8 favorably influence germination of the spores of *Aspergillus niger*, *Penicillium cyclopium*, *Botrytis cinerea*, *Fusarium* sp., and *L. sæpiaria*. Germination is influenced by H-ion concentration, varying with the organism.

Some conditions affecting the growth and activities of Azotobacter chroococcum, E. R. Allen (*Ann. Missouri Bot. Gard., 6 (1919), No. 1, pp. 1–44, pl. 1*).—The experimental work reported in this paper as done with *A. chroococcum* is considered to justify the suggestion that some of the markedly beneficial results observed in cultural solutions by different workers are associated with phosphorus nutrition of the organism and with maintenance of proper reaction of the medium. These experiments do not, however, yield the final proof regarding the mechanism of increased growth. Explanations and suggestions are offered, and some difficulties are indicated.

The physiology of pollen, W. Bobiloff-Preisser (*Bot. Centbl., Beihefte, 34 (1917), 1. Abt., No. 3, pp. 459–492, figs. 18*).—The author details characteristic processes and phases observed in the study of pollen of different plants as affected by various agencies.

The development and contents of conifer needles, W. Kracht (*Bot. Centbl., Beihefte, 34 (1917), 1. Abt., No. 3, pp. 493–562*).—This is a detailed account of the anatomical development and of production of such compounds as starch or tannic acid in needles of different conifers during their first year.

Direct assimilation of organic carbon by Ceratodon purpureus, W. J. ROBBINS (*Bot. Gaz., 65 (1918), No. 6, pp. 543–551, figs. 5*).—It is stated that under the conditions of the experimental study here recorded *C. purpureus* absorbed and utilized organic carbon in the forms of levulose, glucose, galactose, lactose, cane sugar, and maltose, starch being formed in darkness from each of these, but that this moss did not utilize mannite, glycerin, or starch. Levulose as carbon source gave from 2 to 7 times greater growth than glucose, the maximum growth with the former occurring in darkness and with the latter during illumination. The formation of moss plants generally requires light as well as available carbohydrate.

The reduction of carbon dioxid by hydrogen peroxid as a basis for assimilation by plants, H. WISLICENUS (*Ber. Deut. Chem. Gesell., 51 (1918), No. 10, pp. 942–965*).—The author describes the formation of formic acid from hydrogen peroxid.

The assimilation of carbon dioxid, A. STOLL (*Vrtljschr. Naturf. Gesell. Zürich, 63 (1918), No. 3–4, pp. 512–543*).—Summarizing the process of assimilation by chlorophylliferous plants as conceived according to the results of the study and discussion here presented, the author gives an outline of the chemical and enzymotic action supposed to take place between the diffusion of the carbon dioxid through the cell walls from the outside and the appearance of the appropriate carbohydrates.

Willstätter's investigations on carbon dioxid assimilation, H. I. WATERMAN (*Chem. Weekbl., 15 (1918), No. 37, pp. 1138–1146*).—This is chiefly a discussion of earlier and recent work by Willstätter on carbon dioxid assimilation and related matters.

Variation of carbohydrates in leaves, E. MICHEL-DURAND (*Rev. Gén. Bot., 30 (1918), Nos. 359, pp. 337–345; 360, pp. 377–382; 31 (1919), Nos. 361, pp. 10–27, figs. 2; 362, pp. 53–60, figs. 5; 364, pp. 143–156; 365, pp. 196–204; 366, pp. 251–268; 367, pp. 287–317*).—The author presents tabular and other details, with discussion, of a study which he has made of content, transformation, and transference as regards chemical substances in various phases of the leaves of plants belonging to several species, deciduous, evergreen, or annual.

Inulin in plants, its origin and transformations, H. COLIN (*Rev. Gén. Bot., 31 (1919), Nos. 363, pp. 70–80; 365, pp. 179–195; 366, pp. 229–250; 367, pp. 277–286*).—A study of inulin in Jerusalem artichoke, chicory (*Cichorium intybus*), dahlia, elecampane, and other plants is reported.

Inulin arises from the condensation of sugars. This is effected in the tubers, roots, or deeper portions of the stem. In the plants studied, inulin was not found among the substances resulting immediately from chlorophyll assimilation. It may be formed from glucose or levulose. The synthetic and other processes are discussed in case of the substances supposedly involved, including an active diastase and its connection with germination.

Biochemical researches on the physiological rôle of glucosids in plants, R. COMBES (*Rev. Gén. Bot., 29 (1917), Nos. 347, pp. 321–332; 348, pp. 353–375, pls. 3; 30 (1918), Nos. 349, pp. 5–15; 350, pp. 33–49; 351, pp. 70–92; 352, pp. 106–124; 353, pp. 146–156; 354, pp. 177–204, figs. 3; 355, pp. 226–237, figs. 2; 356, pp. 245–269, figs. 5; 357, pp. 283–300, fig. 1; 358, pp. 321–332; 359, pp. 355–365*).—Summing up the main facts brought out in this series, the author claims that plants growing in aseptic cultures, having their roots in contact with a nutritive medium, contain glucosids belonging to the saponins, behaving differently according to the species concerned. Examples of this are given, with discussion.

Immunity of plants to their own products, R. Combes (*Compt. Rend. Acad. Sci. [Paris], 167 (1918), No. 7, pp. 275–278, figs. 2*).—In the course of the work above noted, the author found that in case of Pisum, Polygonum, and Raphanus cultivated under aseptic conditions in Knop's solution with the addition of Agrostemma saponin in strengths ranging from 0.01 to 1 per cent, these plants, which do not produce this glucosid, showed resulting toxic action, while in case of *Agrostemma githago*, which yields the glucosid, a strength of 1 per cent produced no injury.

The development of typical leaf glucosids in germinating and growing plants of Digitalis, W. Straub (*Biochem. Ztschr., 82 (1917), No. 1–2, pp. 48–59, pls. 3*).—It is stated that the specific glucosids in seeds of Digitalis do not constitute reserve material. They do not increase in the cotyledons nor are they utilized there. Leaf glucosids appear in the first foliage leaves, increasing in proportion to about 1 per cent of the dry weight of the latter. The disappearance from the seeds of fats and the formation of chlorophyll are photo-chemical processes, having no direct connection with the synthesis of glucosids, which appear to be merely by-products of the growth of the plant.

Relations between leaf anthocyanin and respiration, G. Nicolas (*Rev. Gén. Bot., 31 (1919), No. 365, pp. 161–178*).—This work has in part been noted from another source (E. S. R., 42, p. 129). It is considered safe to conclude from the data here recorded that the production of anthocyanin is correlated with the formation of organic acids, and that the connection known to exist between oxidation and pigmentation inheres in the production of these acids accompanied by the formation of the red pigment.

Relation between respiration and germinability in seeds, O. K. Hausman and E. P. Ivanicof (In *Hibridicultura y Otros Trabajos de las Estaciones, 1917. Madrid: Estac. de Ensayo de Semillas, 1917, pp. 67–75*).—Having employed in work with cereals the method reported by Quam (E. S. R., 18, p. 332), the author states that, while a certain relation must be admitted to exist between germinability percentage of cereal seeds and carbon dioxid elaborated during the respiration of the seed, it is nevertheless impossible at the present time to determine this relation exactly.

The influence of illumination on the absorption of glucose by roots of higher plants, D. C. de Besteiro and E. Michel-Durand (*Rev. Gén. Bot., 31 (1919), No. 363, pp. 94–108*).—In a study of illumination as related to assimilation in *Pisum sativum* under intensities corresponding mainly to those utilized by Combes and Rose (E. S. R., 29, p. 526), the author found that this heliophilous plant, which has limited power of accommodation as regards chlorophyll assimilation under weak illumination, is equally incapable when developed in such dim light of so increasing absorptive activity of its roots as to cause them to make a sensibly greater increase in the quantity of organic carbon taken from the soil. There is no parallel or compensation between carbon absorption by green leaves in air and absorption of organic carbon by the roots in the soil.

The influence of light on permeability of the plasma membrane and the method of permeability coefficients, A. Tröndle (*Vrtljschr. Naturf. Gesell. Zürich, 63 (1918), No. 1–2, pp. 187–213, figs. 2*).—In tabular detail, the author shows the relations between permeability of the plasma membrane and such factors as light intensity, duration of illumination, and alterations of permeability under natural conditions, also the relations between permeability coefficients and the amount of absorbed salts.

Isotonic coefficients and their utilization in determining permeability, H. Fitting (*Jahrb. Wiss. Bot. [Pringsheim], 57 (1917), No. 4, pp. 553–612*).—Studies are detailed as carried out with *Rhœo discolor* in regard to the isotonic coefficients for potassium nitrate and other salts in connection with cane sugar. The utilization of such coefficients is discussed.

[Osmotic values in plants], A. Ursprung and G. Blum (*Ber. Deut. Bot. Gesell., 34 (1916), No. 2, pp. 88–142, figs. 3*).—Of these contributions on osmotic values, the first deals mainly with their distribution in the plant, the second with their regular variations, and the third with the influence of external conditions in this connection.

Electrical conductivity as a measure of the content of electrolytes of vegetable saps, H. Haynes (*Biochem. Jour., 13 (1919), No. 2, pp. 111–123*).—Attention is drawn to the influence of nonelectrolytes on the conduction of electricity, and a paper of Arrhenius is summarized in which the effect is investigated and its magnitude given for various cases. An examination is made of the causes of the low values obtained in conductivity measurements in fruit juices containing organic acid in considerable quantities. These values are ascribed to the influence of nonelectrolytes and of salts. An attempt is made to estimate the influence of nonelectrolytes and of the changes in the degree of dissociation produced by dilution in certain results obtained by Dixon and Atkins (E. S. R., 29, p. 828) when comparing the sap taken from frozen and from unfrozen plant tissues, and suggestions are made in this connection. A formula is also suggested by means of which in certain cases conductivity measurements may be reduced to standard conditions.

Fibrous protoplasmic structures in plant cells, Å. Åkerman (*Lunds Univ. Årsskr., n. ser., Sect. 2, 12 (1915), No. 4, pp. 64, figs. 28*).—The first part of this study reports an investigation of thread-like protoplasmic structures in plant cells which have been noted under various names in reports of studies on this subject. The second portion relates to alterations in such protoplasmic structures in the cell under the influence of heat, light, narcotics, and plasmolysis.

The significance of the chondriome, A. Guilliermond (*Rev. Gén. Bot., 30 (1918), No. 354, pp. 161–176, pls. 13*).—Much of the material in this discussion has been noted previously (E. S. R., 40, p. 323).

It is stated herein that by means of the special technique employed these elements may be brought out clearly, showing to the eye their existence as specialized constituents of the cell. It is thought that these bodies may act as centers of elaboration for a number of the substances secreted by the cell.

Contributions to the study of the vegetable proteases: I, Introductory, E. A. Fisher (*Biochem. Jour., 13 (1919), No. 2, pp. 124–134*).—A preliminary investigation was undertaken to determine whether the proteoclastic enzyms exist in the ordinary foliage leaves and other parts in case of 14 common crops, and if so, how far they resemble in their action the seed proteases.

The presence of proteinoclastic and peptoclastic enzyms was established in case of each of the green plants examined. An examination was made in detail of beans, peas, and buckwheat as to the difference in enzym content in various parts of the plant, the results of which are tabulated, with discussion, including the bearing of certain facts on digestion of these plants by animals.

Diastase activity in relation to stage of development and carbohydrate content of the tuber of Solanum tuberosum, R. A. McGinty (*Ann. Missouri Bot. Gard., 6 (1919), No. 3, pp. 223–251*).—A study is reported of the diastase activity at various developmental stages of potato juice; also of reducing sugars, sucrose, and starch.

It was found that diastase activity and starch content increased as the tubers developed, coinciding with a decrease in total sugars present. Diastatic activity decreased markedly in potato juice preserved with toluol and kept for 24 hours at room temperature. Apparently, a co-enzym is necessary to the hydrolysis of starch by potato diastase. The activating agent which exists in the juice is not destroyed by boiling, nor is it precipitated by alcohol.

Distribution of mineral elements and nitrogen in etiolated plants, G. André (*Compt. Rend. Acad. Sci.* [*Paris*], *167* (*1918*), *No. 25, pp. 1004–1006*).—Following up the experiments reported by Maquenne and Demoussy (E. S. R., 39, p. 526), the author has determined for white beans the distribution, in stem, cotyledons, and roots of different chemical components.

Nitrogen and phosphorus seem to migrate largely from cotyledons to other portions of the plantlet. The behavior of sulphur is much like that of phosphorus.

Studies on traumatropisms, P. Stark (*Ber. Deut. Bot. Gesell.*, *34* (*1916*), *No. 8, pp. 492–508, figs. 11*).—An account is given of tropisms occurring after injury to seedlings or older plants of different species.

Traumatropism, P. Stark (*Jahrb. Wiss. Bot* [*Pringsheim*], *57* (*1917*), *No. 4, pp. 461–552, figs. 53*).—Detailing extensive data obtained from studies on wound reactions in plants, the author states that while severe traumatic stimulus checks growth, moderate stimulation of this nature may result in growth acceleration. Sometimes these two phases of growth appear successively. Traumatropic reaction may manifest itself as a moderate increase or decrease of growth.

The use of the colorimeter in the indicator method of H-ion determination with biological fluids, B. M. Duggar and C. W. Dodge (*Ann. Missouri Bot. Gard.*, *6* (*1919*), *No. 1, pp. 61–70, fig. 1*).—The work here reported is considered to justify the conclusion that the difficulties involved in the approximate determination of the H-ion concentration of solutions exhibiting color may be largely overcome, and that the useful range of certain brilliant indicators may be so considerably extended that the number of indicators employed may be materially reduced.

The microcolorimeter in the indicator method of hydrogen-ion determination, B. M. Duggar (*Ann. Missouri Bot. Gard.*, *6* (*1919*), *No. 3, pp. 179–181*).—The author points out a modification of the method employed in the work above noted. The standardization of the apparatus for this work is said to be extremely simple, and the technique to be equally applicable when larger types of colorimeter are employed.

Anthocyanin as a microchemical reagent, O. Gertz (*Lunds Univ. Årsskr.*, *n. ser., Sect. 2, 12* (*1916*), *No. 5, pp. 57*).—Of the two sections of this report and discussion, the first deals with anthocyanin as a nuclear stain, the second with this reagent in relation to the bast fibers and woody elements. A bibliography on the subject is appended.

The mounting of microscopic preparations, H. Coupin (*Rev. Gén. Bot.*, *31* (*1919*), *No. 363, pp. 109–114*).—This deals with the technique of mounting plant sections and epidermis, unicellular or filamentous algæ, and pollen grains.

Plant breeder's envelope, R. L. Davis (*Jour. Heredity*, *10* (*1919*), *No. 4, pp. 168, 169, fig. 1*).—An envelope for use by plant breeders is described as having served admirably in work on tender succulent flax plants. It is thought to be adapted to work with other plants.

FIELD CROPS.

[Report of field crops work in Ontario, 1918] (*Rpt. Min. Agr. Ontario, 1918, pp. 12–14, 19, 20, 69–78, fig. 1*).—The development of winter wheat varieties and experimental and demonstration work with alfalfa and potatoes are briefly described. A list is presented of the weeds which proved most troublesome during the past year.

[Report of the Ontario Agricultural and Experimental Union] (*Ontario Dept. Agr., Ann. Rpt. Agr. and Expt. Union, 40 (1918), pp. 9–34, 55–60*).—The following papers were among those presented at the annual meeting held in January, 1919: Results of Cooperative Experiments in Agriculture, by C. A. Zavitz; Summary of Cooperative Experiments in Weed Eradication, 1912–1918, by J. E. Howitt; and The Outlook for Flax Growing in Ontario, by R. L. Defries.

[Report of field crops work in the British Virgin Islands, 1918–19], F. Watts (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Brit. Virgin Isl., 1918–19, pp. 2–5, 6, 7, 9–11*).—This reports the results of variety tests with sugar cane, sweet potatoes, and cassava, and presents information relative to the status of the cotton and sugar industries in the islands.

The yields obtained in the sugar cane variety tests ranged from 7 tons per acre for B. 306 to 14.7 tons for D. 95. The sweet potatoes yielded at the rate of from 750 lbs. per acre for Black Vine to 7,560 lbs. for Spooner. The estimated yields of cassava ranged from 1,944 to 10,160 lbs. per acre for Montserrat varieties, and from 3,996 lbs. for both Cotton Tree and French to 7,560 lbs. for Blancita, Antigua sorts.

[Report of field crops work on the Gold Coast, 1916, 1917, and 1918] (*Govt. Gold Coast, Rpt. Agr. Dept., 1916, pp. 28, 40–42, 44–47, 50, 53–55; 1917, pp. 43–45, 49, 51–53, 55, 58; 1918, pp. 28, 29, 44, 45, 50, 52, 53, 56, 59, 64*).—These reports describe work with miscellaneous field crops conducted at various experimental centers in the colony.

[Agricultural products of French Africa] (In *Matières Premières Africaines. Paris: Émile Larose, 1918, vol. 1, pp. 69–218, 461–498, pls. 12, figs. 8*).—This work, comprising an account of the principal agricultural products of French Africa, contains chapters on cotton, sisal, and hemp prepared by Y. Henry, on kapok by A. Houard, and on peanuts by J. Adam.

[Report of field crops work in Rhodesia, 1917–18], E. A. Nobbs (*Rhodesia Agr. Jour., 15 (1918), Nos. 5, pp. 439–445; 6, pp. 510–515*).—This describes the continuation of work previously noted (E. S. R., 40, p. 230), including rotation experiments with corn, oats, velvet beans, sunflower, buckwheat, Napier fodder grass, broom corn, mangels, sweet potatoes, and radishes, and fertilizer tests with corn and potatoes.

The improvement of pasture land in Morocco, L. Duchellier (*Agron. Colon., 4 (1919), No. 26, pp. 33–41*).—In a general discussion of the subject the author presents a partial list of weeds encountered on clay and sandy soils, together with a list of grasses and other plants suited for both temporary and permanent pastures in western Morocco.

Preparing land for grain crops on the prairies [of Canada], compiled by J. H. Grisdale (*Ottawa, Canada: Dept. Int., 2. ed., pp. 51, pls. 3, figs. 10*).—This edition of a publication previously noted (E. S. R., 30, p. 829), includes agricultural maps and additional information relating to temperature, precipitation, seed, soils, fertilizers, and loans to farmers.

The Devaux method of cereal culture, V. Manvilli (*Coltivatore, 65 (1919), No. 31, pp. 672–679, fig. 1*).—The author briefly discusses the so-called Devaux method of cultivation for cereals (E. S. R., 38, p. 38), and concludes that while the system may be utilized in the rapid multiplication of new varieties it does not lend itself to a practical application in general field practice under conditions prevailing in Italy.

Experiments in methods of sowing barley, 1909–1915, K. Iversen (*Tidsskr. Planteavl, 26 (1919), No. 3, pp. 377–418*).—This describes experiments planned to ascertain the effect of the rate and method of seeding barley on the yield and the tendency to lodge. The plan of the experiment included broadcasting and drilling in rows 10 and 20 cm. apart (about 4 and 8 in., respectively) with different amounts of seed. Tystofte Prentice (Archer type) was employed in all the tests. The results secured may be summarized as follows:

Broadcasting and drilling in rows 10 cm. apart resulted in about the same yield and quality of grain. The principal factor involved is said to be the rate of seeding, this factor determining the possibilities for the development of the crop and its tendency to lodge. Drilling in rows 20 cm. apart yielded on the average 100 kg. per hectare (about 89 lbs. per acre) less than drilling in rows 10 cm. apart. As the quantity of the seed sown decreased, the hectoliter weight and the size of the grain increased. The experiments also appear to indicate that by sowing comparatively small amounts of seed it is possible, within certain narrow limits, to counteract the tendency of the crop to lodge, although in consideration of the quantity of seed necessarily sown in general farm practice this is said to have no practical application.

Corn families of South Dakota, A. N. HUME (*South Dakota Sta. Bul. 186* (*1919*), *pp. 114–134*).—The ear-to-row corn breeding system followed by the agronomy department of the station since 1916 is briefly described and certain observations recorded concerning the results secured. It is stated that by means of this system it is possible to preserve a pedigree of so-called corn families. The pedigree of the ears chosen for planting the 1919 breeding plat are presented in tabular form. The principal features of the author's discussion, together with his recommendations, may be summarized as follows:

The mother ears selected for starting a breeding plat should not only be as numerous as practicable, but should also represent as many sources as possible from among those likely to excel in the qualities desired.

For the same reason mother ears should be systematically introduced into the detasseled rows of the breeding plat in succeeding seasons from stock of other corn breeders and other sources where excellent strains are likely to be found.

It is also suggested that high yielding tested remnants be utilized as largely as possible in making and carrying out plans for corn breeding by selection.

Detasseling all the even-numbered rows in the breeding plat insures that the progeny of these rows will be crossbred.

All of the 12 odd-numbered (sire) rows in any given quarter of the breeding plat can be planted from one single ear, providing the rows are short (10 hills). This sire ear may be selected from the highest yielding row of another quarter, according to plan. It is maintained that these practices may be employed in the production of seed corn, which is said to be the product of crossing strains that are selected for high yield (or any quality), that are selected continuously, and whose sires and dams may have approached a homozygous condition.

Finally, it is concluded that the variety of corn named "All Dakota" produced according to the foregoing plan should ultimately represent a combination of high-yield characters now existent in varieties that are successful in eastern South Dakota, such as Golden Glow, Minnesota 13, Fulton Yellow Dent, and Wimple.

Synthetic production of high-protein corn in relation to breeding, H. K. HAYES and R. J. GARBER (*Jour. Amer. Soc. Agron., 11* (*1919*), *No. 8, pp. 309–318, pl. 1*).—In this paper, a contribution from the Minnesota Experiment Station, the authors discuss the effect of inbreeding and crossbreeding in relation to corn improvement. They conclude that almost unlimited opportunities obtain in the application of these principles.

In an effort to produce a high-protein strain of Minnesota No. 13 corn, an experiment was begun in 1915 in which self-fertilized ears were analyzed for protein and the high-protein ears then employed as parents in a cross. Three F_1 crosses between high-protein strains were studied in 1918 and gave very similar results. An increase in the average protein content of a little more than 2 per cent as compared with Minnesota No. 13 was obtained, while the average yield for the three crosses was 52.3 bu. and for Minnesota No. 13, 48.9 bu. per acre. The crosses are to be further selected for vigor.

A list of 29 references is appended.

Corn production in Kansas, C. C. Cunningham (*Bien. Rpt. Kans. Bd. Agr., 21 (1917–18), pp. 194–255, figs. 29*).—This is a detailed discussion of the adaptations of the crop, the field practices and cultural methods employed in its production, harvesting and storing corn, and insect and other pests affecting corn in the State.

Cotton experiments, 1918, H. B. Brown (*Mississippi Sta. Bul. 186 (1919), pp. 31, figs. 4*).—This describes the continuation of work with cotton along the same general lines as previously noted (E. S. R., 40, p. 234). Dry weather during May, June, and July retarded the growth of the crop, while boll weevil damage was far less than at any time since weevil infestation became widespread over the State.

Wannamaker-Cleveland, Cleveland Big Boll, and Miller are recommended for thin hill land; Trice for rich hill land not infected with wilt; Express, Trice, Foster, and Wannamaker-Cleveland for delta and valley land free from wilt but with heavy weevil infestation; Miller, Wannamaker-Clevelend, Polk, and Columbia for valley land with light wilt infection and light weevil infestation; and Lewis 63 and Tri-Cook for heavy wilt infection but few or no weevils.

It is stated that tests again indicated that close spacing rather than delayed thinning led to increased yields in the single-stalk method of cotton culture. Mississippi-grown seed is deemed superior to seed from any other source.

Information is also given on the fruiting of different cotton varieties, the relation of germination to size of seed, and the amount of cotton ginned by counties in the State prior to December 1 for the crops of 1918 and 1917, respectively.

[The improvement of Egyptian cotton], B. G. C. Bolland (*Agr. Jour. Egypt, 7 (1917), pp. 12–119, pls. 21*).—This comprises a detailed report of statistical information secured during 1915 in connection with efforts to improve, through field selection, existing types of cotton found in Egypt. Observations were made on the rate of growth, flowering, and bolling of different varieties grown at several localities in a study of the life-history of the various sorts in different parts of the country and to determine the possibility of forecasting the yield several weeks previous to picking. Records were also kept of the vegetative characters of a large number of plants representing different types, and a detailed examination was made of the lint and seed in an attempt to ascertain the purity of the different varieties and to select the best plants from each locality for forming the basis of a pure seed supply for that region. The data are presented in tabular form, illustrated diagrammatically, and discussed.

The author states that "in this report will be found, for the first time, the composition in detail of the various types of cotton grown in this country [Egypt], and it will be clearly seen to what an undesirable extent all the different varieties are mixed."

American cotton in the last three crop years, as well as cotton in the British Empire, H. Heizmann (*Tropenpflanzer, Beihefte, 18 (1918), No. 3–4, pp. VI+99–254*).—A comprehensive study is made from census and other official and commercial statistics of the amount and value of the cotton crop of the United States, including lint cotton, linters, seed, oil, and meal, and of warehouse facilities. Interpretative comment is given on price fluctuations, the marketing conditions in the United States and on the Liverpool market, the cause for the rise in cotton prices, the higher total value of the cotton crop owing to the profitable utilization of a higher percentage of it, the time of selling and total value of the crop to the farmer, and also the increased price of agricultural products in general, land rents, and the purchasing power of money. The author then indicates the increased spindleage in the United States and the increasing concern of the Lancashire and Continental cotton manufacturing industries in the curtailed amount of exports of high grades of raw cotton, leading up to a survey of the organization of the British Cotton Growers' Association and of its efforts to encourage cotton growing in the British Empire. In that part of the study devoted to the cotton-growing possibilities of the British Empire, he shows by regions the condition of cotton planting and length and quality of the staple grown. Further consideration is then given to the classification of the principal cotton-producing sections of the United States according to kinds of cotton grown, that data being taken principally from the U. S. Department of Agriculture publications.

Cotton growing in Australia (*Sci. and Indus.* [*Aust.*], *1* (*1919*), *No. 6, pp. 356-360*).—The revival of the industry in Queensland is discussed.

The flax industry in Australia, R. B. WARD (*Sci. and Indus.* [*Aust.*], *1* (*1919*), *No. 6, pp. 361-367, figs. 4*).—The present status of the industry and its future possibilities are briefly outlined.

The industrial exploitation of jume [in Tucumán], C. DÍAZ (*Univ. Tucumán, Inform. Dept. Invest. Indus., 1918, pp. 3-17, figs. 6*).—Jume, a chenopodiaceous plant, the ash of which is said to yield considerable quantities of sodium carbonate, is briefly described, its distribution in Tucumán indicated, and the commercial exploitation of the plant dscussed.

The history of the lupine, H. MICHAELIS (*Ber. Deut. Pharm. Gesell., 29* (*1919*), *No. 6, pp. 518-530*).—This comprises a historical account of the lupine as a cultivated crop.

Sensitiveness of lupines to calcium, T. PFEIFFER and W. SIMMERMACHER (*Landw. Vers. Sta., 93* (*1919*), *No. 1-2, pp. 1-47*).—The authors present additional evidence, supplementing work previously noted (E. S. R., 34, p. 724), secured in experiments conducted during the period of 1914 to 1917, inclusive. It is stated that their results, in general, agree with those secured by Creydt (E. S. R., 35, p. 441), except with regard to the effect of lime upon the lupine nodule-forming bacteria.

Oat growing experiments in Scotland, J. A. SYMON (*Scot. Jour. Agr., 2* (*1919*), *No. 4, pp. 475-481*).—This briefly describes variety, cultural, and fertilizer tests with oats. The necessity for improved and well adapted varieties is emphasized.

Perennial rye-grass (Lolium perenne), L. CARRIER (*U. S. Dept. Agr., Dept. Circ. 42* (*1919*), *pp. 2*).—This contains a brief description of the grass, together with notes on its adaptations, cultivation, and utilization.

The rejuvenation and improvement of potatoes, J. AUMIOT (*Compt. Rend. Acad. Agr. France, 5* (*1919*), *No. 35, pp. 905-910*).—The author briefly outlines the progress of his work with potatoes during 1919, including observations on a large number of plants grown from seed, on artificial crosses between different varieties and different species of Solanum, and on varieties of wild Solanum tubers.

Fertilizer experiments with potatoes, E. H. JENKINS and G. P. CLINTON (*Connecticut State Sta. Bul. 214* (*1919*), *pp. 421, 422*).—In cooperative fertilizer tests during 1917 a complete commercial fertilizer (4:8:4) failed to give any better results than a mixture containing no potash (4:10:0), while the addition of a ton or more of wood ashes to the latter materially increased the yield. The ashes also induced scab, but not enough to seriously injure the market quality of the potatoes.

An experiment was conducted during 1918 in which a comparison was made between a 3:8:3 fertilizer and a 4:10:0 combination. It is stated that the plants receiving potash remained alive 10 days longer than those without potash, while the difference in yield was about 50 bu. per acre in favor of the potash fertilizer, estimated to be a net gain of $64.

Missing hills in potato fields: Their effect upon the yield, L. G. Collison (*New York State Sta. Bul. 459, popular ed. (1919), pp. 5, fig. 1*).—A popular edition of Bulletin 459, previously noted (E. S. R., 41, p. 336).

Preliminary note on the manuring of rice [in Egypt], W. Cartwright (*Agr. Jour. Egypt, 8 (1918), pp. 39–42*).—Applications of farmyard manure made during 1917 to a poor, salty soil resulted in an average yield of 2,100 lbs. of rice per feddan (2,023 lbs. per acre) as compared with 1,316 lbs. for the unmanured plats. On a medium loam soil of average fertility a yield of 3,892 lbs. per feddan was obtained with manure and 2,800 lbs. without.

Sudan grass, H. N. Vinall and R. E. Getty (*Bien. Rpt. Kans. Bd. Agr., 21 (1917–18), pp. 256–266, figs. 6*).—This describes the growing of Sudan grass in Kansas as a hay and pasture crop. It is said to be of secondary importance as a seed crop in the State.

Sugar beet production in Prussia during the war, A. Bartens (*Ztschr. Ver. Deut. Zuckerindus., 1919, No. 760, I, pp. 70–74*).—Statistical information is given relative to the area devoted to the crop and the yields secured.

Report on the sugar-cane experiments for the season 1917–1919, J. R. Bovell and J. P. d'Albuquerque (*Barbados Dept. Agr., Rpt. Sugar-Cane Expts., 1917–1919, pp. 80*).—Fertilizer and variety tests with sugar cane in Barbados are reported on as heretofore (E. S. R., 40, p. 633).

The results of the fertilizer experiments were again seriously affected by the presence on the fertilizer plats of the root borer (*Diaprepes abbreviatus*) and the brown hardback (*Phytalus smithi*), and are deemed inconclusive.

The usual data showing the results of tests with sugar-cane seedlings, with plant and ratoon canes, and with selected varieties of sugar cane grown on numerous experimental plats and on different estates are given in tabular form. Observations are also recorded on the relative value for planting purposes of cuttings from large and small canes, from healthy canes as compared with canes attacked by the moth borer (*Diatræa saccharalis*), and from plant canes as compared with first and second ratoons.

The losses sustained in the field and in the factory from attacks of the moth borer are estimated to average $62.50 and $31.80 per acre, respectively.

The average yield secured from cuttings of large canes amounted to 26.74 tons per acre and from cuttings of small canes 25.99 tons. Cuttings from healthy canes produced at the rate of 25.88 tons and from canes attacked by moth borer 26.4 tons. Cuttings from plant canes, first, and second ratoons produced average yields of 29.89, 30.76, and 27.56 tons per acre, respectively. Since all the plats were seriously affected by insect pests, the results secured are deemed inconclusive.

The highest yield of plant cane secured in the variety tests conducted on the experimental plats in the black-soil districts amounted to 8,706 lbs. of muscovado (raw sugar) per acre for W. No. 2, with Ba. 11403 second with 8,536 lbs., and Ba. 8409 third with 7,738 lbs. White Transparent, the standard variety, produced at the rate of 4,172 lbs. per acre. On the red soils the highest yield, 9,838 lbs., was obtained from B. H. 10 (12), with B. S. F. 12 (27) second with 8,898 lbs., and Ba. 6032 third with 8,341 lbs. The average yield of White Transparent on this soil was 5,352 lbs.

Reports on the comparative yields of different varieties of cane were secured from 16 estates in the black-soil districts and from 13 in the red-soil districts. The highest yield of plant cane on the black soils was secured from Ba. 6032 and amounted to 34.18 tons of cane per acre as compared with 27.27 tons for White Transparent. In the red soil districts the best results were secured from B. H. 10 (12) with 37.82 tons as compared with 31.3 tons for B. 6450, the standard sort for this region. The best yield of first ratoons on the black soil was secured from B. H. 10 (12) with 27.49 tons per acre as compared with 18.57 tons from B. 6450, there being no ratoon crop of White Transparent. B. H. 10 (12) also gave the highest yield, 27.74 tons for the first ratoon crop on red soil as compared with 22.82 tons for B. 6450. In a second ratoon crop grown on red soil the highest yield was obtained from Ba. 6032, and amounted to 26.49 tons as compared with 19.95 tons from B. 6450.

Sugar cane varieties, J. Jeswiet (*Arch. Suikerindus. Nederland, Indië, 26 (1918), No. 10, pp. 383–409, figs. 14; also in Meded. Proefsta. Java-Suikerindus., Landbouwk. Ser., No. 5 (1918), pp. 27, figs. 14*).—Five additional varieties of sugar cane are described in continuation of similar work previously noted (E. S. R., 40, p. 37).

Studies in Indian sugar canes, I–IV, C. A. Barber (*Mem. Dept. Agr. India, Bot. Ser., 10 (1919), Nos. 2, pp. VI+153, pls. 37, figs. 5; 3, pp. 146–179, pls. 8, fig. 1*).—In further contributions to the subject (E. S. R., 40, p. 829), the author describes in Part IV investigations conducted during the seasons of 1916–1917 and 1917–1918, in which an effort was made to ascertain the general principles of branching in sugar cane. The work embraced morphological considerations, such as the early stages of seedlings and sprouted cuttings, periods of growth, above-ground branching, and abnormal bud formation; observations on tillering, including tillering in seedlings and cultivated canes, the period of maximum tillering, artificial interference with tillering, factors influencing tillering, a review of literature on the effect of spacing on tillering and other crop characters, and notes on the relative richness of the juice in branches of different orders; and the dissection of a large number of stools representing different varieties of cane. For each plant dissected a diagram was prepared showing the position of the branches, and an algebraic formula constructed giving the structure of the plant in respect to mature canes. In addition all the canes examined were measured as to thickness and length of joints and notes recorded on runners, curvatures, injuries, etc. The results of the study may be briefly summarized as follows:

The different varieties were found to vary greatly in the rate of maturity and cane formation, but this study was complicated by the fact that all the stools could not be examined at the same time owing to the large number dissected. A series of tables have been prepared showing the relative rate of maturity of the different sorts.

Based on general formulæ of canes at harvest, obtained by averaging the dissections of all the plants of a variety, it was found that the branching in the various groups, from the wild Saccharums to the thick tropical canes, was of the same order, but of very different degree. Letting a represent the main shoot, b its branches, c branches of b, that is, branches of the second order, and so on, a series of formulæ of the canes at crop time were derived, varying from $a+mb+c$ in the thick canes to $a+mb+nc+nd+me+f$ in the wild Saccharums. It is stated that the different groups of Indian canes can be arranged in a series between these two extremes, and it is hoped that a study of these formulæ will throw some light on the stage of development of each group from its supposed wild ancestor.

Differences in form and size between the branches of different orders in the same plant were carefully studied, each cane being measured for the length of the basal branching portion before it assumed its full thickness, the thickness at 2 ft. from the base, the average length of the joints in these 2 ft., the presence of curvature and runners, etc. In all of these characters a tardier development in the first shoot was observed, development increasing in rapidity as the branches of the higher orders were reached. The branches of the higher orders had a tendency to be thicker, to have longer joints, and to show greater curvature. The main shoot possessed a longer basal preparatory portion than its branches, but in the other orders the presence of basal curvatures, needed to place them in a position for upright growth, increased the region of short joints at the base, it being the general rule that a branch did not assume its full form until it was in a position to grow onward unimpeded.

The characters of the branches of different orders were found to be so definite that, when a field was cut, the canes could be separated without difficulty at the mill into early and late. A good deal of similarity sometimes occurred between the *a*'s and *b*'s, especially when the latter became facultative *a*'s, but the change from *b*'s to *c*'s and *d*'s was deemed sufficiently striking to render their distinction generally very easy.

Part V, *on testing the suitability of sugar cane varieties for different localities by a system of measurements, and periodicity in the growth of the sugar cane*, comprises a further contribution to the subject. After summarizing the literature on the growth in length of sugar cane, the author describes a system of cane measurements by means of which it is said to be possible to compare the growth of the same cane in different places, the development of individual cane characters in various surroundings, and the manner in which different conditions affect cane growth in general. The data secured from seven North Indian varieties of cane collected at Coimbatore and distributed to Taliparamba and Samalkota form the basis of this discussion.

The characters of the cane grown in different places, the comparative vigor of growth of each variety in each locality, and the effects of the season upon the length of the joints of cane grown at Samalkota during the seasons of 1915–1916 and 1916–1917 are discussed. A given variety usually attained its best growth in the vicinity of its native habitat.

It is stated that in general, "first in importance, as influencing growth, is the local effect of the place, so much so that, within reasonable limits, it is often possible to form an idea as to what kind of canes and leaves are to be expected from growing any cane variety there. The annual variations in the season and treatment occupy a secondary place, but are sometimes very marked in their effect. Lastly, the variety grown sometimes dominates, and in some farms the individuality of the variety counterbalances the effect of place and climate."

Periodicity in the length of the joints is also discussed, and a possible explanation of the peculiarities in the position of the maxima of joint length advanced. The observational method employed in these studies is said to be inadequate to determine whether the cause of periodicity is external or inherent.

The germination of hulled and hulless timothy seed, M. Heinrich (*Landw. Vers. Sta., 93 (1919), No. 5–6, pp. 259–276*).—The author describes experiments made in an effort to determine the relative germinability of hulled and hulless timothy seed. It is stated that the largest and best-ripened seed lose their hulls most easily, and that in every case the germination of the hulless seeds was poorer than that of the hulled seed. The poorer germination of the hulless seed is attributed to a lowered power of resistance with respect to unfavorable storage conditions. Light was found to retard germination, though it did not affect the final result unfavorably. Hulled and hulless seed behaved alike with respect to the effect of light.

Fertilizer experiments with tobacco, K. DIEM (*Meded. Deli-Proefsta. Medan, 2. ser., No. 4, pp. 108*).—This describes numerous fertilizer tests with tobacco conducted in the field during the period of 1914–1916, inclusive, in various experimental centers in Sumatra.

Selection experiments with Deli tobacco, III, J. A. HONING (*Meded. Deli-Proefsta. Medan, 2. ser., No. 6, pp. 25*).—This describes further observations on pure-line selections of tobacco in continuation of similar work previously noted (E. S. R., 41, p. 644).

Stocks of leaf tobacco (*Bur. of the Census* [*U. S.*] *Bul. 139* (*1918*), *pp. 46, fig. 1*).—The information contained in this publication is essentially the same as that previously noted (E. S. R., 40, p. 533), with the statistical data brought up to date.

Germinating freshly harvested winter wheat, G. T. HARRINGTON (*Science, n. ser., 50* (*1919*), *No. 1301, p. 528*).—The author presents a brief preliminary report on investigations made by the Seed Testing Laboratories of the U. S. Department of Agriculture in a study of the difficulties encountered in germination tests of freshly harvested winter wheat. It is stated that satisfactory germination can be secured, even in wheat taken from standing plants and never allowed to dry out, by the use of a lower temperature than is ordinarily employed.

Of 16 samples of freshly harvested wheat about 99 per cent began to germinate in 5 days at temperatures of from 9 to 16° C. (48 to 61° F.), as compared with an average of 86 per cent for samples germinated at 22°. A temperature of about 15° is recommended for germination tests of freshly harvested wheat.

Removal of the seed coat over the embryo by the use of concentrated sulphuric acid, followed by neutralization of the acid and washing, together with a number of mechanical treatments to expose the embryo and drying the grain at about 40° for one week, gave somewhat beneficial effects in the subsequent germination tests, but are deemed too tedious for general use.

All methods of treatment which were beneficial with winter wheat gave equally good results with spring wheat, and all except the sulphuric acid treatment were used with more or less success in the germination of freshly harvested barley and oats.

On the prevention of heating in wheat by means of air-tight storage, A. DENDY (*Rpts. Grain Pests* (*War*) *Com., Roy. Soc.,* [*London*], *No. 5* (*1919*), *pp. 10, figs. 2*).—In connection with a study of air-tight storage as a preventive measure against stored-grain insects, observations were also made on the effect of the treatment upon the grain itself with particular reference to heating.

It is stated that heating did not occur in wheat stored in hermetically sealed vessels under the conditions of the experiment, and that rotting and the growth of molds were also checked even in the presence of an excess of moisture. Damp wheat stored in sealed flasks became distinctly acid, but it is deemed improbable that any serious acidity would develop in reasonably dry wheat under the same conditions. The method is believed to permit of the storage of grain at a higher moisture content than usual, although the limit of safety as regards the moisture content of wheat intended for prolonged storage in air-tight silos has not yet been determined.

The appearance of two maxima, separated by considerable intervals of time, in the temperature curves of heating wheat is mentioned. As a possible explanation it is suggested that two distinct processes of fermentation are involved, the first being due to enzyms within the grain and the second to microbic fermentation resulting in the rotting of the wheat.

Farm seeds and weeds, H. F. Roberts (*Bien. Rpt. Kans. Bd. Agr., 21 (1917–18), pp. 284–303, figs. 20*).—The more important weeds found in the principal agricultural seeds employed in Kansas are indicated, and those which become noxious on the land are briefly described and illustrated. It is stated that most of the noxious weeds of the State have been introduced into the eastern part of the country from Europe, and have spread to Kansas through the sale and shipment of seed.

Seed reports, 1916, 1917, 1918, J. W. Kellogg (*Penn. Dept. Agr. Bul. 293 (1916), pp. 25; 304 (1917), pp. 31; 322 (1918), pp. 29, figs. 5*).—A report of the seed inspection for these years is given. A total of 491 samples was tested in 1916, 497 in 1917, and 211 in 1918. In the 1918 report illustrations and brief descriptions are given of 100 noxious weed seeds found in farm seeds.

[Seed testing in Wyoming], A. F. Vass (*Wyo. Dairy, Food, and Oil Dept. [Bul.], 3 (1919), No. 1, pp. 8–11*).—This comprises a brief report on the number, kind, and quality of samples of agricultural seed examined by the State agronomist for the year ended September 30, 1919.

HORTICULTURE.

Science and fruit growing, Duke of Bedford and S. Pickering (*London: Macmillan & Co., Ltd., 1919, pp. XXII+351, pl. 1, figs. 53*).—An account of the results obtained at the Woburn Experimental Fruit Farm since its foundation in 1894, progress reports on which have been noted from time to time (E. S. R., 38, p. 540).

Commerce and trade in Italian horticultural products, S. Mondini (*I Trattati di Commercio e i Prodotti della Orticoltura Italiana. San Remo, Italy: Assoc. Ortic. Prof. Ital., 1919, pp. 233*).—In this publication the author has brought together the available information relative to the production and the domestic and export trade in Italy's various horticultural products. The subject matter is based largely on a series of articles appearing in *Bullettino del Associazione Orticola Professionale Italiana*, 1916–1919.

The valuation of fruit trees, P. Lécolier (*Vie Agr. et Rurale, 9 (1919), No. 47, pp. 384–386*).—A discussion of methods of valuing fruit trees for the fixation of indemnities in case of destruction.

The culture of small fruits, F. Pétraz (*Min. Agr. Prov. Quebec Bul. 63 (1919), pp. 80, figs. 46*).—A practical treatise on the culture of strawberries, cane and bush fruits, cranberries, and grapes, with special reference to conditions in Quebec.

Grape diseases and modern methods of controlling them, K. Müller (*Rebschädlinge und Ihre Neuzeitliche Bekämpfung. Karlsruhe (Baden): G. Braunsche Hofbuchdruckerei und Verlag, 1918, pp. VII+203, pls. 3, figs. 65*).—A contribution from the Agricultural Experiment Station at Augustenberg describing the more important diseases and insect pests of grapes and methods used in their control, including both spraying treatment and the breeding of resistant types.

Six years' experience with budded avocados, J. T. Whedon (*Ann. Rpts. Cal. Avocado Assoc., 1918–19, pp. 51–53*).—Notes on the present condition of a number of varieties of budded avocados planted in 1914 and at later dates.

The avocados of Mexico: A preliminary report, W. POPENOE (*Ann. Rpts. Cal. Avocado Assoc., 1918–19, pp. 58–74, pls. 6*).—A contribution from the University of California, comprising a preliminary report of investigations on the avocados in Mexico. Information thus far secured is given relative to the history and distribution of the avocado in Mexico, the classification of the various species and races involved, soil and climatic conditions under which they are found, methods of culture, harvesting and marketing, the bearing habits, character of the fruit, etc.

Essays on tea plucking, C. P. COHEN STUART, E. HAMAKERS, and E. L. SIAHAJA (*Dept. Landb., Nijv. en Handel* [*Dutch East Indies*], *Meded. Proefsta. Thee, No. 65 (1919), pp. 79, pls. 13*).—This comprises the following papers relating to different phases of tea plucking: Experiments on the Decapitation of Tea Shoots (Pruning, Plucking, and Regeneration) (pp. 1–47), and Notes on Plucking Terms and Plucking Methods (pp. 63–79), by the senior author; Observations on Tea Plucking (pp. 48–53), by E. Hamakers; Some Opinions on Hamakers' Articles (pp. 54–57), by the senior author; and Notes on White Tip (Imperial) Plucking (pp. 58–62), by E. L. Siahaja.

Commercial rose culture, E. HOLMES (*New York: A. T. De La Mare Co., Inc., 1919, 2. ed., pp. 196, pls. 2, figs. 67*).—A revised and enlarged edition of this practical guide to modern methods of growing the rose for market purposes (E. S. R., 26, p. 337).

FORESTRY.

A policy of forestry for the Nation, H. S. GRAVES (*Amer. Forestry, 25 (1919), No. 310, pp. 1401–1404*).—In continuation of a previous paper (E. S. R., 41, p. 540) the author presents a further outline of a policy of forestry for the Nation.

Annual report of the director of forests, 1918, E. H. F. SWAIN (*Ann. Rpt. Dept. Pub. Lands Queensland, 1918, pp. 54–69, pls. 4*).—A report on the activities of the Queensland Forest Service for the calendar year 1918, including a discussion of the general forest situation in Australia and Queensland and notes on silvical and research work, forest protection, organization, demarcation, and utilization. Data dealing with revenues, expenditures, the timber cut, and progress in the saw-milling industry are also given.

A suggested departure in National Forest stumpage appraisals, H. R. FLINT (*Jour. Forestry, 17 (1919), No. 7, pp. 823–828*).—The author briefly discusses the present method of making stumpage appraisals, and suggests some changes which, it is believed, would increase the accuracy of the appraisals and tend to promote sales.

Comments on a suggested departure in National Forest stumpage appraisals, J. W. GIRARD (*Jour. Forestry, 17 (1919), No. 7, pp. 828–831*).—This comprises comments on the above noted article.

Alinement charts in forest mensuration, D. BRUCE (*Jour. Forestry, 17 (1919), No. 7, pp. 773–801, figs. 15*).—A contribution from the University of California, in which the author presents six charts applying to certain of the most commonly used formulas of forest mensuration and discusses their application. The use of alinement charts in the solution of various other formulas is also considered.

An analysis of logging costs in Ontario, compiled by G. A. MULLOY and W. M. ROBERTSON (*Jour. Forestry, 17 (1919), No. 7, pp. 835–838*).—The data here presented represent averages for the Province of Ontario. They were compiled from a large number of reports and supplemented and checked by data of the compilers.

A volume table for hewed railroad ties, J. W. Girard and U. S. Swartz (*Jour. Forestry, 17 (1919), No. 7, pp. 839–842, fig. 1*).—The authors here present a tie volume table constructed for larch and Douglas fir, showing the number of ties to be obtained from each diameter and height class.

British Guiana timbers, L. S. Hohenkerk (*Jour. Bd. Agr. Brit. Guiana, 12 (1919), No. 3, pp. 152–187*).—A descriptive list with the available information relative to 60 timber trees of British Guiana. A list is given of authorities consulted, and two tables of mechanical tests of various woods are appended.

Basket willow culture in Maryland, K. E. Pfeiffer (*Baltimore: Md. State Bd. Forestry, 1919, pp. 24, pls. 9*).—A small treatise on basket willow culture, based on a survey of the industry in Maryland and on the literature of the subject. Information is given relative to preparation of the soil; selection of varieties; methods of preparation, culture, havesting, and marketing of the crop; yields and returns; and enemies of the willow.

Observations and considerations on the inflorescence, fruiting, and seed forming in Cinchona ledgeriana Moens, C. Feenstra-Sluiter (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Kina Proefsta., No. 6 (1919), pp. 35, pls. 3, figs. 20*).—A study of the flower biology and reproduction in the Cinchona tree, including notes on breeding and selecting methods for Cinchona.

In artificial pollination experiments made by the author on two trees, the flowers were self-sterile, whereas with cross-pollination both trees yielded fruit and seed in all cases. In view of the fact that other investigations have indicated the self-fertility of *C. ledgeriana*, the author concludes that for Cinchona the condition of fertility or sterility is closely related to form-variation in the flowers. The results of sterility investigations with several other plants are briefly reviewed.

Bordered pits in Douglas fir: A study of the position of the torus in mountain and lowland specimens in relation to creosote penetration, G. J. Griffin (*Jour. Forestry, 17 (1919), No. 7, pp. 813–822, fig. 1*).—The purpose of this study was to secure definite information as to the position of the tori of the bordered pits in Douglas fir, as found under a variety of conditions, and to determine, if possible, the effect of these on penetration with creosote. Results of the study are summarized as follows:

A considerable number of the summerwood tori in both the sapwood and heartwood of the mountain-grown specimens of Douglas fir were already aspirated in the greenwood. This was not true in the lowland specimens. In the air-dry sapwood and heartwood of the mountain-grown material a still larger proportion of aspirated tori in both spring and summerwood were found. In the air-dry heartwood of the lowland material aspirated tori were noted in the springwood, but in the summerwood the tori were all in the central position. Oven-drying tended to increase the number of aspirated tori in both mountain and lowland specimens. Creosoted specimens showed a fair to good penetration, especially in the summerwood in the lowland, but very poor or practically no penetration in the mountain-grown material. Lack of penetration coincided directly with the number of tori aspirated.

Treatments of air-dried material with air and steam caused no apparent displacement of the tori from the position held in matched untreated pieces from specimens. Green lowland-grown material soaked in alcohol and then oven-dried showed the tori in the same positions after treatment that they held when the wood was in the green condition—that is, they did not become aspirated on drying, as did the tori in the specimens not treated with alcohol.

On the causes of natural coagulation in the latex of Hevea brasiliensis, G. Vernet (*Bul. Agr. Inst. Sci. Saigon [Cochin China], 1 (1919), No. 11, pp. 342–347*).—The author presents evidence to show that, contrary to the opinions of certain investigators, the intervention of enzyms is unnecessary for the promotion of coagulation in Hevea latex. Diluted and boiled latex may be coagulated either by adding acetic acid or by adding mineral acids such as sulphuric, nitric, hydrochloric, etc. Coagulation in the presence of ferments is attributed merely to the acidity caused by the ferments rather than to enzymatic action.

It is pointed out that the phenomenon of coagulation should not be confounded with ulterior processes in the coagulum which are due to microorganisms.

Effect of fertilization on the seed of Jeffrey pine, E. N. MUNNS (*Plant World, 22 (1919), No. 5, pp. 138–144*).—In the spring of 1914 the author conducted some hand-pollination experiments with the Jeffrey pine (*Pinus jeffreyi*) in the San Bernardino Mountains of southern California, with a view to determining the effect of the parents on the seed. The experiments were conducted with thrifty trees, insect-infested trees, suppressed trees, and mistletoe-infested trees. Seeds resulting from the various pollinations were sown under nursery conditions, and germination data secured which are here presented in tabular form and discussed.

In general, the pollen from thrifty trees was found to transmit some of the parent's characteristics to the seed which it fertilized, since the seed, the germination percentage, and the real germination value as well as the seedling growth are larger when the cones on poorer trees are fertilized with it. An apparent contradiction was found when pollen from poorer trees was used in fertilizing the cones of thrifty trees, for the cones from the thrifty tree furnish the larger and healthier seed, no matter what tree furnished the pollen. It is suggested that this may be due to the greater strength of the pistillate flowers. Pollen from insect-infested trees apparently has no effect upon the seed produced. The effect of the pistillate flowers of the infested tree was not determined in these experiments.

Trees affected with mistletoe had half as many more seed to the pound as were found in the cones on thrifty trees, but the germination was 20 per cent lower and the seedlings were not so vigorous, though the real value of the seed was about the same. The suppressed, malformed, and diseased trees gave the largest number of seed to the pound, and this seed had the lowest germination percentage, the lowest real value, and produced the smallest trees in the nursery.

Cross-fertilization appears desirable because it produces larger sized seed, greater germination powers, higher real value to the pound, and better growth in the seedling stage. This is apparently true no matter whether applied to the suppressed or infested trees or to the best trees in the stand. These results appear to show that in timber sale practices only thrifty seed trees should be left, and that all diseased and suppressed trees should be removed in order to secure in the future the best possible forest.

The management of a teak forest, H. C. WALKER (*Indian Forester, 45 (1919), No. 11, pp. 561–578*).—A discussion of management practices on reserved teak forests in Burma, maintained for export purposes.

Turpentine orcharding effect on long-leaf timber, G. DROLET (*Jour. Forestry, 17 (1919), No. 7, pp. 832–834*).—Some data are given showing the effect on the timber of turpentining long-leaf pine under different conditions. The data indicate that under proper conditions of turpentining the timberland owner may realize an income from the sale of turpentine materials without materially damaging the timber.

"Built-up wood," O. M. BUTLER (*Amer. Forestry, 25 (1919), No. 310, pp. 1410–1414, figs. 7*).—An account of the work of the Forest Products Laboratory at Madison, Wis., in developing methods of building up various wooden articles from smaller material of special forms or types of lumber to replace or to serve as substitutes for full-sawn or solid material.

The wood-using industries of Maryland, F. W. Besley and J. G. Dorrance (*Baltimore: Md. State Bd. Forestry, 1919, pp. 122, pls. 22*).—A statistical study of the wood-using industry in Maryland, with special reference to the year ended September 1, 1916. In addition to data on the amounts and varieties of woods employed in the various industries, tables and descriptions are given which show the kinds of wood manufactured in each county of the State, with the amounts grown in Maryland, the United States, and foreign countries, and the total quantities used and what they cost.

DISEASES OF PLANTS.

The first decade of the American Phytopathological Society, C. L. Shear (*Phytopathology, 9 (1919), No. 4, pp. 165–170*).—A review is given of the organization and subsequent development of the American Phytopathological Society.

Plant pathology in Japan, H. A. Lee (*Phytopathology, 9 (1919), No. 4, pp. 178, 179*).—A brief sketch is given of the organization and extent of pathological work in Japan.

On the development of plant pathology in Japan: A brief historical sketch, M. Shirai (*Ann. Phytopath. Soc. Japan, 1 (1918), No. 1, pp. 1–4*).—This contains information on injuries to plants in former times, chiefly by insect pests and other nonparasitic agencies, and also in recent years. Periodicals and other publications are mentioned. Reference is made to K. Miyabe as a source of information regarding plant pathology.

Philippine plant diseases, O. Reinking (*Phytopathology, 9 (1919), No. 3, pp. 114–140*).—Lists are given of a number of the more common diseases affecting economic plants in the Philippines, the diseases being described under the host plants, which are arranged alphabetically.

[Important diseases of food plants], F. Behrens (*Jahrb. Deut. Landw. Gesell., 30 (1915), No. 2, pp. 42–53*).—This is a review of the more important diseases of food cereals, legumes, and tubers.

The relation of temperature and humidity to infection by certain fungi, J. I. Lauritzen (*Phytopathology, 9 (1919), No. 1, pp. 7–35*).—The purpose of the study here presented was to determine the influence of temperature and humidity upon infection, and to find out whether a film of water covering the surface of the plant is essential for the fungus to become established upon the host. Studies were made of *Colletotrichum lindemuthianum* on beans, *Ascochyta fagopyrum* on buckwheat, and *Puccinia graminis* on wheat.

The lower limit of temperature for infection of wheat in these experiments was 42°, beans 57°, and buckwheat 45° F. The maximum temperature for infection was, for wheat and beans 80° and buckwheat 100°. There appeared to be no definite optimum of temperature for infection in the hosts and parasites used, where the number of infections was used as a measure of the amount of infection and sufficient time was allowed for the fungi to establish a relation with the hosts. The range of humidity for infection of buckwheat varied between 90 and 100 per cent and for wheat and beans between 92 and 100 per cent. A film of water covering the leaf surface was not found essential to infection.

Daylight fumigation with hydrocyanic acid, H. J. Quayle (*Cal. Citrogr., 4 (1919), No. 11, p. 292*).—The difference between daylight and darkness in relation to fumigation with hydrocyanic acid is said to be a difference in regard to light, temperature, and moisture, affecting the plant through the influence of each of these or combinations thereof on stomatal opening, chemical relations affecting gas absorption, and cuticular defense.

Soil disinfection by hot water to control the root-knot nematode and parasitic soil fungi, L. P. Byars and W. W. Gilbert (*Abs. in Phytopathology, 9 (1919), No. 1, p. 49*).—A report is given of experiments made to determine the possibility of using hot water as a means of disinfecting small quantities of soil infested with the root-knot nematode (*Heterodera radicicola*) and the damping off organisms *Rhizoctonia* sp. and *Pythium debaryanum*. The work was carried on with soil in 4 and 8 in. pots and in shallow benches, and the investigations showed that the immersion of 4-in. pots of infested soil in boiling water for five minutes killed all the organisms concerned. The application of 8 liters of boiling water to 8-in. pots of similarly infested soil gave identical results. The pouring of boiling water over infested soil at the rate of 7 gal. per cubic foot of infested soil practically eliminated the nematode and fungi from shallow benches.

Experiments on the control of the root-knot nematode, Heterodera radicicola, L. P. Byars (*Phytopathology, 9 (1919), No. 2, pp. 93–104, pl. 1*).—An account is given of experiments in the use of hydrocyanic acid gas in loam soil for the control of the root-knot nematode, the experiments being conducted in the greenhouses in Washington, D. C., and at the Plant Introduction Station of the Department at Brooksville, Fla. It was found that hydrocyanic acid gas as liberated in loam soil by applications of sodium cyanid and commercial ammonium sulphate failed to eradicate the root-knot nematode from the soil, even when applied at the rate of 3,600 and 5,400 lbs., respectively, per acre.

No infection, however, was found at the end of the first season on dasheen plants grown in plats treated with those quantities, or where two-thirds of the amounts were used. In the same plats at the end of the season there was found to be a mild infection. Where the plats received from one-third to one-sixth of the above quantities of the chemicals, less than half the test plants showed infection the first season, while at the end of the next year every plant grown in the plats was infected. The chemicals were found to be about equally effective in powdered or liquid form. On account of the cost and because of the imperfect control hydrocyanic acid gas is not considered to be a practicable means for controlling the root knot on large areas of loam soil. On a small scale, however, it is thought that it might be used to advantage.

Rhizoctonia in lawns and pastures, C. V. Piper and H. S. Coe (*Phytopathology, 9 (1919), No. 2, pp. 89–92, pls. 2*).—The authors' attention was called to a trouble affecting the turf in golf courses near Philadelphia, and later the same disease appeared near Washington and elsewhere. Studies were made that left no doubt that the trouble in question was due to *Rhizoctonia solani*. Various lawn plants differ in susceptibility to the fungus, which appeared in the vicinity of Washington with the first hot, muggy weather of summer. With the appearance of hot, dry weather, the disease is greatly checked. Experiments with Bordeaux mixture, applied at short intervals when the disease first makes its appearance, seemed to indicate that it could be successfully controlled in this manner. Various chemicals applied to the soil were tested, but none proved satisfactory. Experiments which have been in progress for three years with the different varieties of grass showed varying susceptibility, and some of the bent grasses are considered very encouraging for future planting.

Further studies on the specialization of black cereal rust in Sweden and other lands, J. Eriksson (*Centbl. Bakt.* [*etc.*], *2. Abt., 48 (1918), No. 16–19, pp. 349–417*).—The author has extended his studies, formerly noted (E. S. R., 14, p. 771), and gives the results in detail for rust on different cereals in various regions.

On the grain of barley or wheat, infected by smut fungus through the flower, S. Miura (*Ann. Phytopath. Soc. Japan, 1 (1918), No. 1, pp. 16–26*).—This is in the Japanese language, with a summary in English and a bibliography.

It is stated that the length, width, thickness, weight, and specific gravity of grains infected by smut through a flower are smaller than those of healthy ones, either in barley or wheat. Diseased mature grains lose in luster and color. Smut spores on the stigma of barley or wheat soon germinate, penetrating its tissue and showing mycelium in the embryo after two or three days. Smut spores germinate on the stigma, which is rich in mucilage, but seldom elsewhere. It is not thought probable that smut mycelium can infect through the wall of pistils.

The parasitism of Puccinia graminis tritici and P. graminis tritici-compacti, J. G. Leach (*Phytopathology, 9 (1919), No. 2, pp. 59–88, pls. 3*).—The infection capabilities of the two biologic forms mentioned were studied on 72 varieties of wheat, and they show that *P. graminis tritici-compacti* has a narrower host range than the other form. As a rule the hard spring wheats are resistant to the first, while the soft winter wheats are susceptible. The hard winter wheats show varying degrees of resistance, and no one of the groups of wheats was found resistant to *P. graminis tritici*. The two forms seem to be distinct and constant, and each has its specific food requirements which determine its ability to infect a common host species.

Foot-rot disease of wheat—historical and bibliographic, F. L. Stevens (*Ill. Dept. Registr. and Ed., Div. Nat. Hist. Survey Bul., 13 (1919), Art. 9, pp. 259–286, fig. 1*).—In April, 1919, a serious wheat disease was noted in Madison and other counties in Illinois, also in several counties of Indiana, its most constant character being a darkening, and in several cases, a rotting of the basal portions of the stems. Other characters are to be described in a later paper.

This disease, which alone or with diseases of similar character has been variously named in widely separated regions, is more commonly known in this country as "take-all," and is attributed to several fungi, notably *Ophiobolus herpotrichus*. A descriptive and historical account of the disease is given, with points of agreement and disagreement. An extensive bibliography is also furnished.

Wheat scabs as affected by systems of rotation, J. R. Holbert, J. F. Trost, and G. N. Hoffer (*Phytopathology, 9 (1919), No. 1, pp. 45–47*).—The authors report a survey made of the occurrence of wheat scab in the vicinity of Bloomington, Ill., prior to the harvest of 1918, which indicates an intimate relationship between the occurrence of the scab organism and systems of cropping. The survey was confined to the study of 1,500 acres of representative wheat fields, in which the previous crops were considered and the percentage of scab in different parts of the field determined.

Where wheat followed two years of corn, the highest percentage of scab was observed in every case. Wheat following one year of corn generally showed more scab than where it followed some other crop than corn. Where corn had been removed for silage, a less degree of scab infection was found than where the stalks were allowed to remain in fields. Wheat following wheat did not present as much scab infection as where wheat followed corn in the same or adjacent fields. Wheat following oats showed the lowest average scab infection.

The highest percentage of scab seemed to occur at the base of elevations where trash would collect from a washed down slope. On the most elevated portions of the fields there was generally a thinner stand, and here the lowest scab infection was found.

A simple method of distinguishing nematode galls of wheat from bunted kernels, A. BERG (*Phytopathology, 9* (*1919*), *No. 4, pp. 181, 182, fig. 1*).—According to the author, typical bunt kernels due to the wheat nematode (*Tylenchus tritici*) may be recognized by the fact that the noninfected kernels have developed an apical tuft of hair known as the brush, while in many cases the infected kernels do not have the brush but have an indentation at the tip.

A dry method of treating seed wheat for bunt, G. P. DARNELL-SMITH and H. ROSS (*Agr. Gaz. N. S. Wales, 30* (*1919*), *No. 10, pp. 685–692, figs. 7*).—The authors describe a method of seed treatment for the prevention of bunt in wheat whereby dry copper carbonate was dusted through the seed at the rate of 2 oz. of the fungicide per bushel of grain. Hand-mixing is said to be inadequate, the use of a machine that thoroughly mixes the powder with the grain being regarded as essential for the best results.

Additional field experiments (E. S. R., 38, p. 448) were conducted on the Wagga and Cowra experiment farms during 1917 and 1918 in a further comparison of seed treated with the dry copper carbonate and that immersed in a copper sulphate solution. The results of the earlier experiments were confirmed, a marked increase in yield being secured with the copper carbonate treatment. The principal advantages claimed for the dry method over the solution method include the elimination of water, freedom from injury to either the seed or the young plant, accompanied by improved germination and increased yield, the lack of deleterious effects on seed subjected to delayed germination in a dry seed bed, the treatment of the seed at the farmer's convenience without reference to the planting date, and a considerable reduction in the labor and time required to treat the seed.

Inheritance of anthracnose resistance as indicated by a cross between a resistant and a susceptible bean, G. P. MCROSTIE (*Phytopathology, 9* (*1919*), *No. 3, pp. 141–148*).—Results are given of a study of crosses of beans, one of the parent plants of which was susceptible and the other resistant to anthracnose. Three generations of the host have been studied, and observations relating to the disease resistance in the different generations are given. From a study of the third generation, as well as observation of a number of plants, it was found that only a single factor exists between resistance and susceptibility in this particular cross. The ratios obtained throughout between resistant and susceptible plants indicate quite clearly a single factor difference to the one strain of anthracnose concerned in the cross.

Additional varieties of beans susceptible to mosaic, D. REDDICK and V. B. STEWART (*Phytopathology, 9* (*1919*), *No. 3, pp. 149–152*).—In continuation of a previous account (E. S. R., 41, p. 155), the authors have reported a number of additional varieties of beans which are susceptible to the mosaic disease. The variety Robust appears to be quite resistant to mosaic. A number of species and varieties of related leguminous plants have been tested and found to be either immune or highly resistant.

Hot water seed treatment for blackleg of cabbage, J. B. S. NORTON (*Abs. in Phytopathology, 9* (*1919*), *No. 1, pp. 50, 51*).—According to the author, the treatment of cabbage seed with formaldehyde and corrosive sublimate did not prevent the development of fungi on seed in sterile agar tubes. Treatments with hot water were undertaken, and it was found that cabbage seed could be subjected to hot water without injury, and at certain temperatures the Phoma spores were killed without the seed being affected. In experiments with late cabbage, where the seed was treated with water at 56° C. (132.8° F.) for 10 minutes the plants were almost free from Phoma and only a few failed to head, while in an untreated plat the growth was very uneven, especially when young, and many of the plants failed to produce marketable heads.

Onion diseases and their control, J. C. Walker (*U. S. Dept. Agr., Farmers' Bul. 1060 (1919), pp. 24, figs. 13*).—Popular descriptions are given of the more important diseases occurring in the field, in storage, and in transit. Among the diseases occurring in the field the author describes smut, mildew (blight), leaf-mold, Fusarium rot, pink-root, and root-knot, and among the diseases primarily important in storage and transit are neck-rot, soft-rot, black-mold, and smudge (anthracnose blackspot). Suggestions are given for the control of some of these diseases, the onion smut being readily controlled by applying formaldehyde solution by means of a drip attachment to the seeder. Mildew (blight) is said to be controlled by avoiding excessive soil moisture, by the practice of crop rotation, and by thorough cultivation. The storage diseases can be controlled by giving attention to cultural methods and to sanitary measures.

Some constitutional diseases of the potato, P. A. Murphy (*Canad. Hort., 42 (1919), No. 1, p. 9*).—A lowering in potato yield from 206 bu. per acre in British Columbia to 190 bu. in the Maritime Provinces, 140 in Quebec, and 123 in Ontario is ascribed largely to various diseases, prominent among which are leaf roll and mosaic. The main general remedy recommended is the periodical introduction of healthy stock from localities known to be free from such diseases.

Some potential parasites of the potato tuber, M. Shapovalov (*Phytopathology, 9 (1919), No. 1, pp. 36–42, figs. 2, pls. 2*).—An account is given of inoculation experiments on potato tubers with pure cultures of *Penicillium oxalicum*, *Aspergillus niger*, and *Clonostachys rosea*. As a result of the experiments, it appears that there are unrecognized fungi which have received but little study in relation to crops but which deserve greater attention. A number of organisms have been found to possess parasitic potentialities, and some of them may become active agents for destruction.

Potato wart: A dangerous new disease (*U. S. Dept. Agr., Dept. Circ. 32 (1919), pp. 4, figs. 3*).—A brief account is given of the potato wart due to *Chrysophlyctis endobiotica*, a more extensive account of which has already been noted (E. S. R., 40, p. 543).

Cooperative potato spraying in 1917, G. P. Clinton and L. F. Harvey (*Connecticut State Sta. Bul. 214 (1919), pp. 411–420*).—This describes cooperative spraying experiments conducted on five farms with homemade 4:4:50 Bordeaux mixture in a continuation of work previously noted (E. S. R., 38, p. 235). Hot weather seriously interfered with the results in two of the fields by prematurely killing or injuring the vines, while blight caused no conspicuous injury except in one field. It is stated that the spraying harmed rather than helped one field through the trampling of the vines in spraying, that two fields were sufficiently benefited to pay the cost of spraying, that one field gave a slight increase (18 bu.) above the cost of spraying, and that in the field in which blight was prevented by spraying the increase above the cost of spraying was quite marked (95 bu.).

Sweet potato mosaic, M. R. Ensign (*Phytopathology, 9 (1919), No. 4, pp. 180, 181*).—The author reports observing a mosaic disease of sweet potatoes near Pine Bluff, Ark., in the fall of 1918. The symptoms are said to be very characteristic, but there appears to be no evidence that the disease is directly communicable between adjacent plants. Further investigation of the disease is said to be in progress.

Rust resistance in timothy, H. K. Hayes and E. C. Stakman (*Jour. Amer. Soc. Agron., 11 (1919), No. 2, pp. 67–70*).—Incomplete data from an interrupted study of four groups of pedigreed timothy plants are given in tabular form with discussion.

Fusarium root-rot of tobacco, J. Johnson (*Abs. in Phytopathology, 9 (1919), No. 1, p. 49*).—A study has been made of the tobacco soils in Connecticut Valley and in Maryland, where there seems to be considerable deterioration in the crop produced. Much of the reduced yield has been attributed to loss of fertility or to Thielavia root-rot. The investigations showed, however, the presence of species of Fusarium, and the conclusion is drawn that these organisms are parasitic upon the roots of the tobacco. No single species was determined with certainty to be the one causing the disease. Certain leguminous plants, especially cowpeas and also tomatoes, were attacked.

Macrosporium solani on tomato fruit, J. Rosenbaum (*Abs. in Phytopathology, 9 (1919), No. 1, p. 51*).—Numerous complaints having been received that the early blight or nail-head spot, *M. solani*, on tomato fruit originated in transit led to an investigation of the subject. The author claims that recent work with Florida-grown winter tomatoes showed that the disease did not originate in transit on mature fruit shipped either ripe or green. Fruit approximately more than 6 in. in circumference is said to be not susceptible to the disease even under the most favorable conditions for infection.

Keeping quality of strawberries in relation to their temperature when picked, N. E. Stevens (*Phytopathology, 9 (1919), No. 4, pp. 171–177*).—Studies are reported on the effect of temperature at the time they are picked on the keeping quality of strawberries, particularly with reference to the fungus *Rhizopus nigricans*. It was found that strawberries picked early in the morning, while cool, generally keep better, even though wet, than similar berries picked later, after they have been warmed by the sun.

Inspection of phænogamic herbaria for rusts on Ribes, G. P. Clinton (*Connecticut State Sta. Bul. 214 (1919), pp. 423–427*).—A report is given of a study of the specimens of Ribes occurring in a number of the leading herbaria to determine if possible the early presence of *Cronartium ribicola* in this country. Only negative evidence was obtained, but data were secured relative to the occurrence and distribution of three other rusts occurring on various species of Ribes: *Æcidium grossulariæ*, *Coleosporium ribicola*, and *Puccinia ribis*.

An attempt was made to determine whether *Cronartium ribicola* was present on specimens of *R. longiflorum* without success. Early collections showed the species to be present on several specimens of Ribes, but all were on material of foreign origin.

Infection experiments of Pinus strobus with Cronartium ribicola, G. P. Clinton and F. A. McCormick (*Connecticut State Sta. Bul. 214 (1919), pp. 428–459, pls. 8*).—The authors report the successful inoculation with *Cronartium ribicola* of white-pine leaves and exposed bud leaves on which stomata had developed. No infections were secured through stem inoculation. According to the authors' opinion infection takes place through the stomata, and the early presence of the fungus is indicated by the appearance of yellow spots on the leaves. Abundant evidence has been obtained of substomatal vesicles indicating penetration by way of the stomata rather than through the epidermis.

The development of the fungus is believed to require a four-year period, infection taking place from late summer to late fall through the leaves. During the following spring the yellow spots on the leaves become more or less conspicuous, and later there is an invasion on the stem which causes slight swelling and discoloration and in some cases pycnia are produced. The third year there is further swelling of the stem and possibly stunting of the leaves with pycnial development. There may be the formation of æcia during the fourth year in most cases, although where slight or local infection has taken place the formation of pycnia and æcia may be delayed for a longer time.

For the control of the white pine blister rust the authors recommend the elimination of Ribes in the vicinity of seed beds, thorough spraying of the beds with Bordeaux mixture after midsummer if grown in an infected region, the use of uninfected seedlings only for planting, inspection of plantations from foreign stock for infected pines, and the destruction of all wild or cultivated Ribes in plantations and for 300 yds. about the plants.

Investigations of white pine blister rust, 1918, P. Spaulding (*Abs. in Phytopathology, 9 (1919), No. 1, p. 54*).—A brief summary account is given of the investigations carried at four field stations in New England and New York. It is claimed to be definitely established that the æciospores of the fungus are distributed for miles by means of winds. The uredospores have a less wide dissemination. The sporidia from the telia apparently produced infection for relatively short distances only. White pines on Block Island are said to have borne blisters after an incubation period of about 18 months.

Oomycetes parasitic on pine seedlings, C. Hartley and G. G. Hahn (*Abs. in Phytopathology, 9 (1919), No. 1, p. 50*).—As a result of inoculation experiments, the authors have determined that *Pythium debaryanum* occurs parasitically on pine seedlings. In addition, a strain of *Rheosporangium aphanidermatus* was found by repeated inoculations to infect *Pinus banksiana* successfully. An unidentified species of Phytophthora was obtained from *P. resinosa*, and another oomycete, *Pythium artotrogus* from *P. banksiana* proved a weak or doubtful parasite on other species of pine. The authors consider *P. debaryanum* the only oomycete of economic importance on pine seedlings.

Notes on some Uredinales attacking pines, G. G. Hedgcock and N. R. Hunt (*Abs. in Phytopathology, 9 (1919), No. 1, p. 53*).—The authors report successful inoculations with the æciospores of *Cæoma strobilina* from cones of *Pinus heterophylla* and *P. palustris* infecting the leaves of several species of oaks, producing uredinia with small sori in about two weeks. After several months immature telial sori were produced which were considered as belonging to Melampsora or a related genus. *C. conigenum* taken from *P. chihuahuana* infected the leaves of oaks, producing uredinia with large sori in about two weeks.

A study of the rots of western white pine, J. R. Weir and E. E. Hubert (*U. S. Dept. Agr. Bul. 799 (1919), pp. 24*).—Data are presented regarding the principal rots of the western white pine. The main wood-destroying fungi, occurring in the order of their importance, are *Trametes pini*, *Polyporus schweinitzii*, and *Fomes annosus*. Most of the rot found in the tree is said to be traceable to *T. pini*.

In general more of the rots are found on the bottom sites and lower slopes. Age of the trees is said to be also an important factor in the occurrence of the fungi, the number of sporophore-bearing trees increasing with increased age of the tree. The maximum production of sporophores is said to occur in trees 121 to 160 years old.

Relative importance of Pythium and Rhizoctonia in coniferous seed beds, R. G. Pierce and C. Hartley (*Abs. in Phytopathology, 9 (1919), No. 1, p. 50*).—These two fungi are reported to be the most important parasites of pine seedlings. They both are found in seedlings from what appear to be the same infection focus, and both have been obtained from single seedlings. Both fungi are said to possess strains that have little or no capacity for attacking pines, and there was but little difference observed between the weaker strains of Rhizoctonia and those of Pythium. There were found a few virulent strains of Rhizoctonia which proved more destructive to pines than the strongest of the Pythium strains worked with.

Fungi which decay weaveshed roofs, R. J. BLAIR (*Abs. in Phytopathology, 9 (1919), No. 1, pp. 54, 55*).—An examination of a roof of a weaveshed in Massachusetts showed that at least three species of fungi, *Lentodium tigrinum*, *Fomes officinalis*, and *Lenzites trabeum*, were causing decay of the roof.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Recollections of the early days of the Biological Society, L. O. HOWARD (*Proc. Biol. Soc. Wash., 32 (1919), pp. 271–280*).

Mutanda ornithologica, VIII, H. C. OBERHOLSER (*Proc. Biol. Soc. Wash., 32 (1919), pp. 349, 240*).

Description of a whippoorwill from Porto Rico, A. WETMORE (*Proc. Biol. Soc. Wash., 32 (1919), pp. 235–238*).

Insect artizans and their work, E. STEP (*London: Hutchinson & Co., [1919], pp. X+318, pls. 39*).—A popular account.

Economic entomology, A. H. COCKAYNE (*New Zeal. Dept. Agr., Indus., and Com. Ann. Rpt., 1918–19, p. 42*).—It is said that two insect pests, previously scarcely known in New Zealand, namely, the pear bud-midge (*Contarinia piri*) and a leaf hopper (*Europasca* sp.), have been extremely destructive.

Rules and regulations of the State Plant Board of Mississippi (*Miss. State Plant Bd. Circ. 2 (1919), pp. 32*).—This includes a list of insects and plants likely to become infested and declared to be public nuisances.

The corn leaf hopper (Peregrinus maidis), D. T. FULLAWAY (*Bd. Commrs. Agr. and Forestry Hawaii, Div. Ent. Bul. 4 (1918), pp. 16, figs. 18*).—This is a report of investigations of *P. maidis*, a serious enemy of maize in Hawaii, where it is estimated 10,000 acres were grown in 1918. The species undoubtedly was introduced into the island within recent years and is found only on corn. In confinement, however, it will oviposit in the stems of sugar cane and Job's tears (*Coix lacryma*), but the nymphs apparently can not develop on these plants. In the Philippines and other regions of the Malay Archipelago, it has been observed by Muir and Osborn feeding on native grasses. Its attack on the plant causes a rapid withering, which resembles that due to drought.

The eggs are deposited principally in the midrib of the leaves on the upper face, and sometimes in the stalk in cavities hollowed out in the soft cellular tissue. They are rather closely packed, one to four in each cavity, which is marked externally by a scar and a little whitish wax. The average number of eggs deposited by a single female is about 200, though one individual laid 306 in a period of 30 days and had 32 eggs remaining in the body at death. They hatch in the summer in 9 days, but under dry conditions the period has been protracted to 14 days. Five nymphal stages are passed through in from 15 to 21 days. A dimorphism is commonly experienced among the adults, some having the wings long and others having them short. The brachypterous forms are unable to fly, but can hop quite vigorously. The life cycle of the leaf hopper requires about one month for its completion during the summer.

Artificial control measures have not as yet proved practicable, the most effective control thus far secured being through parasitic insects. The egg parasites, parasitism by which may average 50 per cent and range from 10 to 90 per cent, include *Paranagrus osborni* and *Anagrus frequens*, which occur in about equal numbers, and *Ootetrastichus beatus*, known as the Formosan Ootetrastichus, introduced from Formosa in 1916. A dryinid parasite (*Haplo-*

gonatopus vitiensis) develops on the nymphs and adults. Mention is also made of several predacious enemies.

Response of the eggs of Aphis avenæ and A. pomi to various sprays, particularly concentrated lime-sulphur and substitutes, season of 1918–19, A. Peterson (*Jour. Econ. Ent., 12 (1919), No. 5, pp. 363–384, figs. 5*).—The author draws conclusions which relate to the structure, behavior, and response of the eggs of *A. avenæ* and *A. pomi*, and probably *A. sorbi*, to environmental factors and various sprays, based on his studies for a period of three years.

"The eggs are not only most susceptible to evaporating factors when many of the eggs are splitting their outer shells, but they are most easily killed by various contact sprays applied at this time. Experiments with a large number of contact sprays at their recommended winter strength show conclusively that concentrated liquid lime-sulphur (1:9) is the most efficient. The lower efficiency of recommended winter strengths of dry lime-sulphur and substitutes is probably in part due to the lower sulphur content of each. The insoluble character of dry lime-sulphur is also important in accounting for its inefficiency.

"Nicotin added to any spray increases its efficiency in killing the eggs of *A. avenæ* and *A. pomi*. This was particularly true where nicotin (1:500) is added to the recommended dormant strengths of concentrated liquid lime-sulphur, dry lime-sulphur, and substitutes ('B. T. S.' and 'Soluble Sulphur').

"Sodium sulphocarbonate (1:9 or 1:14) kills a large percentage of eggs, and is worthy of further investigation. Various sprays made with hydrated lime, strong fish-oil soap solutions, miscible oil ('Scalecide,' 1:15 to 1:140), crude carbolic acid, cresols, linseed and cottonseed oil emulsions, etc., only kill a small percentage of eggs during December, January, and February and the early part of March. Some of these sprays kill 80 to 95 per cent of the eggs if applied when the fruit buds first show green (March 21, 1919).

"The New Jersey Agricultural Experiment Station is recommending a delayed dormant spray of concentrated liquid lime-sulphur (1:9), combined with nicotin (blackleaf 40), 1:500. This spray should be applied when the fruit bud is swollen and first shows green. Applications made after the leaves are out 0.5 in. or more will burn the foliage of most varieties."

Reports of investigations by the author have been previously noted (E. S. R., 38, p. 561; 41, p. 253).

[Plant lice transmit mosaic], W. Stuart (*Potato Mag., 2 (1919), No. 6, p. 16*).—The author reports that studies which were conducted during the season of 1919 furnish conclusive evidence that one of the chief methods of transmission of mosaic disease of potatoes, and possibly the only one, is by plant lice.

A dosage schedule for citrus fumigation with liquid hydrocyanic acid, R. S. Woglum (*Jour. Econ. Ent., 12 (1919), No. 5, pp. 357–363, fig. 1*).—The fumigation schedule developed by the author is based upon extensive experiments conducted in California during the season of 1918 in operations covering several hundred acres of orange and lemon trees, both large and small, infested with the black, purple, or red scales.

Notes on the pupæ of the European corn borer, Pyrausta nubilalis and the closely related species P. penitalis, E. Mosher (*Jour. Econ. Ent., 12 (1919), No. 5, pp. 387–389, figs. 2*).—The author finds that the pupæ of *P. nubilalis* and *P. penitalis* are much more easily distinguished than the larvæ. The main differences in the pupæ are illustrated by drawings, the most striking difference being the blunt projection on the head of *P. penitalis*.

An injurious leaf miner of the honeysuckle, C. R. Crosby and M. D. Leonard (*Jour. Econ. Ent., 12 (1919), No. 5, pp. 389–392, fig. 1*).—This is a report of observations of *Lithocolletes fragilella*, an outbreak of which on Belgica honeysuckle in a nursery at Honeoye Falls, N. Y., was called to the author's attention in August, 1917. The plants growing in the open were badly infested by the miners, nearly every leaf showing one or more mines. Notwithstanding the heavy infestation the injury to the plants was negligible. When, however, cuttings were taken from these plants and placed under glass in the cutting beds the leaves were so badly injured by the miners that the cuttings failed to grow. Owing to the great difficulty of growing plants from green cuttings due to the depredations of the insect, this method of propagation is said to have been abandoned at this nursery and hardwood cuttings used instead.

Brief notes are given on observations of the habits of this moth, which has previously been reared from mines in the leaves of *Lonicera* spp. in Massachusetts, Texas, and Michigan.

Notes on the bionomics of Stegomyia fasciata, I, J. W. Fielding (*Ann. Trop. Med. and Parasitol., 13 (1919), No. 3, pp. 259–296, fig. 1*).—This is a report of studies conducted in Australia.

The apple maggot, L. Caesar and W. A. Ross (*Ontario Dept. Agr. Bul. 271 (1919), pp. 32, figs. 17*).—This is a report of investigations in Ontario commenced in 1911 and carried on in large part during the years 1912 and 1913, after which time the pest almost totally disappeared from the orchard in which the work was being conducted.

The species occurs in Ontario in the counties extending from the Ottawa River on the east to Lake Huron and the Detroit River on the west, although the total number of orchards infested is small, probably less than 5 per cent in any county and much less than 1 per cent in the Province as a whole. In Ontario, it has been found infesting only the fruit of apples, crab apples, and a few of the many species of haws. A list is given which shows the degree of susceptibility to attack of various varieties of apples and crabs. A somewhat extended account is given of its life history and habits, which includes data in tabular form. The studies indicate that there is a partial second brood in some years in the southwestern or warmer parts of the Province, which must, however, be a very small and almost insignificant one.

The work has definitely proved that the apple maggot can be controlled by spraying at least twice with arsente of lead—2½ lbs. of paste to 40 gal. of water. It was found that neither molasses nor any other sweetened substance is necessary, since the flies feed upon small particles of arsenate of lead even after all the water used in spraying has evaporated. It is pointed out that similar results showing arsenate of lead to be a satisfactory method of control have been obtained in Brittain and Good in Nova Scotia.

In order to make the spraying a success it must be done at the right time, every tree in the orchard must be sprayed, and if there are badly infested orchards or trees close by they also must be sprayed. The first application should be made as soon as the flies begin to emerge, in order that they may be killed before they can oviposit, which in ordinary seasons in the warmer portions of the Province would be about June 25. The second application should be made as soon as the first shows signs of disappearing, usually in about three weeks, but in two weeks if the weather is wet. A third application should be made in about another two weeks if there have been many heavy rains to wash off the second, and is a good insurance in all cases the first year after a bad infestation. Every application should be fairly heavy, almost as heavy as for the codling moth. It is also well to spray plum, cherry, pear, and other trees if many are present. At the second and third application only those trees whose fruit is nearly ripe and which if sprayed would be dangerous to the consumer should be omitted. Every effort should be made to have owners of orchards close by cooperate in spraying; otherwise, it will be found difficult to secure a high percentage of clean fruit. Should the orchards be 20 rods or so away the danger from them is not usually great. After two years' treatment it should be possible usually to rely upon the regular codling moth spray or this supplemented by one application the first week in July.

A recent bulletin relating to the subject by O'Kane has been noted (E. S. R., 32, p. 153).

Naphthalene v. chicken lice, W. A. Abbott (*Jour. Econ. Ent., 12 (1919), No. 5, pp. 397–402*).—This is a report of observations made during the course of testing proprietary insecticides and their ingredients by the Bureau of Entomology of the U. S. Department of Agriculture at the entomological laboratory at Vienna, Va.

The author finds that "powders containing 5 per cent or less of naphthalene are of no value against lice. Powders containing from 10 to 20 per cent are very effective. As little as 10 per cent naphthalene may temporarily injure hens, if the powder is well rubbed in, and 60 per cent or more may kill treated fowls under the same conditions. Naphthalene (60 to 100 per cent) sprinkled over the backs of fowls at roost proved to be of considerable value against lice. Naphthalene nest eggs are of no value against lice on laying or setting hens. The data obtained indicate that setting hens, the eggs, and possibly any chickens hatched are injured by these eggs."

The chicken sticktight flea (Sarcopsylla gallinacea), C. E. Sanborn (*Oklahoma Sta. Bul. 123 (1919), pp. 3–8, figs. 3*).—A popular summary of information on *S. gallinacea*, which occurs in all the Southern States. It thrives best in an arid or semiarid mild climate.

Hibernating habits of two species of ladybirds, D. E. Fink (*Jour. Econ. Ent., 12 (1919), No. 5, pp. 393–395, pl. 1*).—These notes relate to the hibernating habits of two species of ladybird beetles, namely, the spotted ladybird beetle (*Megilla maculata*) and the squash ladybird beetle (*Epilachna borealis*), both seeking cavities or loose bark on trees for protection, in Tidewater Virginia.

The bean ladybird and its control, F. H. Chittenden (*U. S. Dept. Agr., Farmers' Bul. 1074 (1919), pp. 7, figs. 3*).—This is a summary of information on *Epilachna corrupta*, which is now well established in New Mexico and Arizona and is found more rarely in western Texas, where it is a source of injury to the bean plant. A report of studies of this pest by Merrill has been previously noted (E. S. R., 37, p. 465).

Xanthonia villosula injuring forest trees, W. H. Wellhouse (*Jour. Econ. Ent., 12 (1919), No. 5, pp. 396, 397*).—During the summer of 1918 in the vicinity of Ithaca, N. Y., the author found a small brown leaf beetle (*X. villosula*) riddling the leaves of forest trees. The hornbeam (*Carpinus caroliniana*) and the ironwood (*Ostrya virginiana*) were the most frequently attacked but it also feeds on the leaves of a number of other species.

Notes on Platydema ellipticum and its fungus host, H. B. Weiss (*Canad. Ent., 51 (1919), No. 12, pp. 276, 277*).—The author reports finding the larvæ and pupæ of this tenebrionid in abundance in the fungus *Polyporus gilvus* at Union, N. J.

Conserving our natural resources of sugar, E. F. Phillips (*Nat. Hist., 19 (1919), No. 4–5, pp. 416–420, fig. 1*).

The fowl tick and how premises may be freed from it, F. C. Bishopp (*U. S. Dept. Agr., Farmers' Bul. 1070 (1919), pp. 16, figs. 9*).—This replaces the author's earlier account of *Argas miniatus*, issued as Bureau of Entomology Circular 170 (E. S. R., 29, p. 58). His studies have shown that carbolineum is more destructive to the ticks than is petroleum, persists longer, and has the advantage of drying into the wood so as not to soil the fowls. Anthracene oil, which is the principal constituent of carbolineum, has been found to be about as effective as carbolineum in tick destruction, but is difficult to obtain. The author recommends that roosts be supported from the floor and kept entirely free from the walls.

The depluming mite of chickens: Its complete eradication from a flock by one treatment, H. P. Wood (*Jour. Econ. Ent., 12 (1919), No. 5, pp. 402–404*).—In the course of experiments in the control of poultry lice, tests were also made of a number of substances for the control of the depluming mite (*Cnemidocoptes gallinæ*), which was met with in a few flocks. Of the substances tested, lime-sulphur, tobacco sulphur, dry sulphur, arsenical dip, kerosene emulsion, and sodium fluorid, sulphur, and soap were effective. In a flock of 48 fowls infested with lice and the depluming mite, it was found that the parasites were destroyed by dipping the fowls in a solution of sodium fluorid (C. P.) ¾ oz., sulphur 2 oz., laundry soap ½ oz., and about 1 gal. of water. Examinations of feathers plucked from the treated fowls, made at intervals from 27 days to 1½ years after treatment, failed to show the presence of either mites or lice.

FOODS—HUMAN NUTRITION.

Food and the public health, W. G. Savage (*New York and London: Cassell & Co., Ltd., 1919, XI+155, pls. 8*).—This book, which is written in nontechnical language for the general public, contains chapters on food as a cause of ill health or disease, chemical additions to food, bacterial diseases disseminated through foods, alcoholic and other beverages, milk and milk products, meat foods, foods of vegetable origin, and shellfish.

Progress in food chemistry, H. Beckurts, O. Beck, and I. Rüder (*Jahresber. Untersuch. Nahr. u. Genussmtl., 24 (1914), pp. 205*).—This is the 1914 edition (published in 1916) of the yearbook previously noted (E. S. R., 33, p. 258). The subjects covered are the same as in the previous edition.

Food control, from the standpoint of nutrition, E. V. McCollum (*Amer. Food Jour., 14 (1919), No. 10, pp. 27, 28, 30*).—In this lecture, delivered at the Convention of American Dairy, Food, and Drug Officials held in New York City in September, 1919, the author discusses the possibility of introducing into food control a classification and labeling of foods and feeding stuffs which would indicate the quality of the product from the standpoint of the present ideas of nutritive value. This is considered by the author to be more feasible and important in the case of commercial feeding stuffs than of human foods, and suggestions are given for extending the value of feeding stuff labels by including certain data in addition to the chemical composition.

Standards of living (*Washington: Bur. Appl. Econ., Inc., 1919, pp. 49*).—This is a compilation of recent budgetary studies from various sources.

The lowered nutritive value of the commonest food materials and its influence upon the food situation, H. Haupt (*Chem. Ztg., 43 (1919), Nos. 34, pp. 134, 135; 35–36, pp. 142, 143*).—The author discusses the lowered food value of many of the common articles of food in Germany as the result of war conditions. A table is given in which the calorific value of the food materials making up the ration for a certain period in 1918 in East Saxony is compared with corresponding values of the same food materials in normal times. The ration for a single day furnished 1,252 calories, while the same food materials if of normal composition would have furnished 1,451 calories.

The utilization of blood protein and skim milk protein in food, T. LAEHNS (*Ztschr. Fleisch u. Milchhyg., 27 (1917), No. 15, pp. 229–232*).—This article contains directions for the use of slaughterhouse blood in bread, porridge, puddings, etc., and of casein in bread, noodles, and dumplings.

Economy in feeding the family.—V, Condensed or evaporated milks, malted milks, and milk powders, J. P. STREET (*Connecticut State Sta. Bul. 213 (1919), pp. 399–407*).—This bulletin contains analyses of 43 samples of unsweetened, 84 sweetened, and 6 sweetened and skimmed condensed milks examined in 1904, 1906, 1909, 1916, and 1919; 7 samples of malted milk, representing 4 brands examined in 1908 and 1915; 8 samples of dried milks, representing 7 brands examined from 1909 to 1918; 1 sample of Hebe, an evaporated skimmed milk to which about 6 per cent of coconut oil has been added, examined in 1918; and 3 samples of sugar-free milk of two brands examined in 1913 and 1919. The tables are accompanied by a brief explanation of the nature and particular value of each of these milk products.

The earlier papers in this series have been noted as follows: (E. S. R., 38, pp. 662, 663; 39, pp. 366, 878).

Delicious products of the dairy, J. O. McDOWELL (*U. S. Dept. Agr., Dept. Circ. 26 (1919), pp. 12, figs. 8*).—Popular suggestions for the use of dairy products.

Use of poultry club products (*U. S. Dept. Agr., Dept. Circ. 36 (1919), pp. 14, figs. 6*).—This circular, prepared especially for home-demonstration clubs and poultry clubs, contains material on the use of poultry products, including recipes for the use of eggs in a variety of ways, directions for dressing and cooking chicken, recipes for various chicken dishes, and directions by J. W. Kinghorne for preserving eggs for home use.

Preliminary study in the bacteriology of jellied meat products, J. A. ALLEN (*Amer. Jour. Vet. Med., 14 (1919), No. 8, pp. 394–397*).—Following an outbreak of meat poisoning in Toronto in 1917 attributed to contaminated jellied tongue, an investigation was made of the customary methods of preparing jellied meats and of the bacterial content of spoiled jellied meats, of the containers, and of the gelatin used in the preparation of the product. All were found to be heavily contaminated with microorganisms, principally *Bacillus proteus vulgaris*, *B. subtilis*, *B. mesentericus*, and *B. coli*. *B. botulinus*, *B. enteritidis*, and the hog cholera bacillus were not found.

It was found possible to sterilize jellied meat products in the final containers at 15 lbs. steam pressure for 15 minutes without affecting the solidifying properties of the gelatin. Jellied meats prepared in this way showed no deterioration at the end of 60 days, while the products put up by the ordinary commercial method without sterilization showed signs of decomposition in 10 days.

The effect of milling on the digestibility of Graham flour, C. F. LANGWORTHY and H. J. DEUEL (*Proc. Natl. Acad. Sci., 5 (1919), No. 11, pp. 514–517*).—Digestibility experiments with Graham flour obtained by grinding Minnesota spring wheat by different processes are reported, the flour being used in the form of a quick bread with a basal ration of fruit, butter, and sugar.

The amount of protein digested varied from about 70 per cent in the roller mill flours, in which the particles of bran were the largest, to 78 per cent in the stone-burr mill and steel-burr mill flours, in which the bran particles were much finer. The coefficient of digestibility for carbohydrate varied from 93.4 per cent in the coarse roller mill flour to 96.8 per cent in the stone-burr mill flour.

The authors conclude that "it is fairly safe to say that the finer a bran-containing flour is ground, the more completely it is utilized by the human body."

Potato flour and potato bread, J. A. Le Clerc (*Potato Mag., 1 (1919), No. 8, pp. 9, 10, 29–31, 33, figs. 5*).—The use of potatoes and potato products as part substitutes for wheat in bread making is discussed from the standpoint of analyses and baking tests conducted at the Bureau of Chemistry, U. S. Department of Agriculture, by H. L. Wessling, and from data showing the relative cost and yield of potatoes and wheat in terms of available nutrients.

"Bread made with approximately 15 per cent of potato flour or with 40 per cent boiled potato is appreciably richer in mineral constituents than is white bread, but somewhat poorer in fat and protein when compared on the same moisture basis. With flour at $12.80 per barrel and potatoes at $1.75 per bushel, flour is cheaper than potato and will furnish considerably more dry matter, protein, fat, starch, and heat units for one dollar. On the other hand, potatoes will furnish over four times as much mineral ingredients as will white flour for the same money. From the agricultural point of view one acre of land devoted to potatoes (yield 100 bu.) will produce considerably more food for man than will one acre of land on which 14 bu. of wheat have been harvested."

[Kiln-dried green maize (gaudes) of Echenon], C. Granvigne (*Ann. Falsif., 12 (1919), No. 127–128, pp. 145–147*).—The author states that in Burgundy and certain other parts of France the name "gaudes" has been given to maize flour (an early yellow variety) and to a product made from it by boiling with milk, butter, and salt. A particular variety of this maize flour known as "gaudes of Echenon" is prepared by grinding to a fine powder kiln-dried green maize. The product is said to have an odor similar to chocolate and to be especially prized in many localities. It has been found possible to distinguish this particular variety from products of inferior quality designated by the same name by the fact that the ratio of total nitrogen to soluble nitrogen, according to the method of Rousseaux and Sirot (E. S. R., 38, p. 711), is 12 : 15 instead of 5 : 6 as in the case of ordinary maize flour.

Lupine bread, Pohl-Breslau (*Berlin. Klin. Wchnschr., 56 (1919), No. 20, pp. 457, 458*).—The author advocates the use of meal made from lupine seeds as a part substitute for wheat or rye flour in bread making on account of its high nitrogen content, and reports metabolism experiments indicating that the nitrogen of the lupine meal is entirely absorbed.

Fruit in the home, R. Marescalchi-Baur (*Le Frutti in Casa. Casale Monferrato: Marescalchi Bros., 1918, 3. ed., pp. XIII+127, figs. 2*).—This is the third edition of a collection of Italian recipes for the preservation and utilization of fruits in the home, together with general directions for the preparation of sugar sirups, gelatins, and sherbets.

Hydrogenated oils in nutrition, F. Bordas (*Ann. Falsif., 12 (1919), No. 129–130, pp. 225–235*).—This is a report presented to the Superior Council of Public Hygiene (France) on the suitability of various hydrogenated oils for human consumption and the possible toxicity of the small amount of nickel contained therein. Data from the literature are presented showing that the amount of nickel present in hydrogenated oils is much less than the amount often absorbed by food prepared in nickel utensils.

Infant feeding with melted butter flour, M. Türk (*Deut. Med. Wchnschr., 45 (1919), No. 19, pp. 521–523*).—A substitute for milk in infant feeding is prepared by melting 20 gm. of butter and heating it over a low flame for 4 or 5 minutes until the odor of fatty acids disappears. The fat is then mixed thoroughly with 20 gm. of wheat flour and heated over an asbestos plate with constant stirring until it becomes a thin brown liquid. This is added to 300 gm. of warm water and 15 gm. of brown sugar, heated again, strained through a hair sieve and added while still warm to previously heated and cooled cow's milk, generally in the proportion of two parts of the butter flour to one part of milk.

The mixture is said to resemble human milk closely and to have an agreeable taste. For weak and under-weight infants in the first month it is not recommended as a sole substitute for mother's milk, but exceptionally strong new-born infants and those over a month old are said to make good progress on this food alone. It does not protect infants from rickets or parenteral infections, but is thought to produce a heightened immunity toward skin diseases.

The deleterious effect of the alkalization of infants' food, A. F. Hess and L. J. Unger (*Jour. Amer. Med. Assoc., 73 (1919), No. 18, pp. 1353–1356, figs. 2*).—A study of the possible factors involved in the development of infantile scurvy on a diet of malt soup indicated that the antiscorbutic vitamin in the milk was destroyed by the alkali present in the alkaline malt soup extract. That the antiscorbutic vitamin in milk is rapidly destroyed by alkalization associated with heating was also proved by feeding experiments with guinea pigs. Attention is therefore called to the necessity in infant feeding of supplementing alkaline proprietary foods with an antiscorbutic foodstuff such as orange juice or canned tomato.

The rôle of the antineuritic vitamin in the artificial feeding of infants, A. L. Daniels, A. H. Byfield, and R. Loughlin (*Amer. Jour. Diseases Children, 18 (1919), No. 6, pp. 546–554, figs. 7*).—Reports with accompanying charts are given of the effect upon the growth of normal babies of additions of antineuritic vitamin to diets supplying an adequate number of calories.

It was found that growth was stimulated by the addition of wheat embryo extract, of an alcoholic extract of vegetables, and of vegetable soup used as part diluent in milk modifications, all of which are considered to contain the antineuritic vitamin. The fact that the artificially fed infant requires a larger amount of food than the breast-fed infant is thought to be due to the small amount of antineuritic vitamin in diluted cow's milk. The authors are also of the opinion that failure to gain in infants and young children is often the result of an insufficient amount of the antineuritic vitamin in the food, and that consequently the diets of the young should be more carefully scrutinized with this in mind.

The deficiency aspect of maize products, H. H. Green (*Rpts. Dir. Vet. Research, Union So. Africa, 5–6 (1918), pp. 753–774*).—A detailed study is reported of the relationship between the content of maize products in phosphoric oxid and antineuritic vitamin. The usual feeding experiments with pigeons were employed, the basal diet in the earlier experiments consisting of polished rice and in the later of samp of very low phosphoric acid content, which was substituted for the rice in order to express the data for maize independently of a nonmaize base. The samples of maize employed consisted of whole maize and a wide variety of milling products, the phosphoric acid content being determined in every case.

The analytical data obtained indicate that the distribution of vitamin in the individual maize kernel follows the distribution of phosphoric oxid, as both are located in approximately the same parts of the grain and would vary proportionately in the different products of milling. It was found, however, that this parallelism between phosphoric oxid and vitamin content did not hold between different samples of maize from different localities. In these the phosphoric oxid content was found to vary widely, while no difference in vitamin content could be detected. "It is therefore impossible to use phosphoric oxid as indicator of vitamin unless the phosphoric oxid content of the original mother grain be known. This information is rarely available, and the determination of

P_2O_5 as a general analytical guide to efficiency—as advocated by Voegtlin, Sullivan, and Myers [E. S. R., 36, p. 464]—is therefore ruled out of court. Their standard for maize flour, which assumes that 'the P_2O_5 content should not be less than 0.5 per cent,' would condemn more safe samples than it passed."

It is thought that the same lack of absolute relationship between phosphoric oxid and vitamin exists in rice and other cereals, and that while a P_2O_5 standard has proved practicable in specific localities it is not universally applicable.

Other points brought out in the investigation are that maize meal can stand autoclaving at 125° C. for several hours without noticeable destruction of vitamin, thus indicating the improbability that any of the methods commonly used in cooking maize brings about a deficiency in the vitamin, and that highly polished rice contains considerably more vitamin than samp, and perhaps from one-half to two-thirds of the average avian or human requirements.

White corn v. yellow corn and a probable relation between the fat-soluble vitamin and yellow pigments, H. STEENBOCK (*Science, n. ser., 50 (1919), No. 1293, pp. 352, 353*). Evidence from the work of the author and of other investigators is submitted from which the hypothesis is advanced that the fat-soluble vitamin is a yellow plant pigment or a closely related compound.

Carotinoids as fat-soluble vitamin, L. S. PALMER (*Science, n. ser., 50 (1919), No. 1300, pp. 501, 502*).—The author cites a number of instances from the literature where the relationship between carotinoids and fat-soluble vitamin suggested above by Steenbock apparently breaks down. It is admitted, however, that the similarity of certain of the properties of the two kinds of material offers a working basis for the ultimate isolation of the fat-soluble vitamin.

Carotinemia: A new clinical picture, A. F. HESS and V. C. MYERS (*Jour. Amer. Med. Assoc., 73 (1919), No. 23, pp. 1743–1745*).—It has been found that in children on a diet rich in carotin (carrots, spinach, egg yolks, oranges, etc.) a yellow discoloration somewhat resembling jaundice often develops. The discoloration of the skin is accompanied by a similar yellow coloration of the blood serum and plasma and of the urine, the pigment in all cases being carotin.

The pigmentation of the urine, which is readily increased or decreased by a corresponding increase or decrease in the amount of carotinoids fed, is considered of particular interest in view of the fact that the urinary pigments have hitherto been thought to originate solely from bile or its derivatives.

The antiscorbutic value of the banana, H. B. LEWIS (*Jour. Biol. Chem., 40 (1919), No. 1, pp. 91–101, figs. 4*).—A study of the antiscorbutic value of the banana in experimental scurvy in guinea pigs is reported with the following results:

Guinea pigs fed on an exclusive diet of bananas rapidly lost weight and died in from 20 to 30 days in a condition of marked inanition, but with no lesions characteristic of scurvy. Bananas in amounts greater than 25 gm. as a supplement to a diet of rolled oats prevented the onset of scurvy, but did not bring about normal growth in young animals. As a supplement to a scurvy-producing diet of autoclaved rolled oats, bran, milk, casein, and inorganic salts, from 10 to 15 gm. only of bananas was sufficient to protect against scurvy, the diet then resulting also in rapid growth of young guinea pigs.

"These experiments suggest that a lower content of the antiscorbutic principle may be sufficient to protect against scurvy if the diet is adequate in its content of the other essential dietary constituents."

Experiments with rats and dogs on a lipoid-free diet, W. STEPP (*Ztschr. Biol., 69 (1919), No. 10–11, pp. 495–513*).—The author has supplemented his earlier experiments (E. S. R., 41, p. 559) upon lipoid-free diets, in which mice were used as experimental animals, by similar experiments using rats and dogs. The results reported are thought to confirm the earlier conclusions that both lipoids and vitamins are essential for life. In the absence of both, there was a rapid loss of appetite and of weight accompanied by a marked weakness in the hind legs of the animals. Death usually occurred in a few weeks. The spleen and pancreas were found to be atrophied, and the cholesterol content of the bile was lower than normal. The addition of a small amount of a vitamin preparation, Orypan, to a lipoid-free diet resulted chiefly in improving the appetite, and in preventing the muscle weakness, but did not prevent a gradual loss in weight followed by death after a somewhat longer time, nor did it prevent atrophy of the spleen and pancreas or a lowering of the cholesterol content of the bile.

Observations on the cholesterin content of the blood and bile of animals on a lipoid-free diet, W. STEPP (*Ztschr. Biol., 69 (1919), No. 10–11, pp. 514–516*).—Attention is called to the observations made in the above study that the cholesterin content of the blood of dogs fed a lipoid-free diet was but little lower than normal, while the cholesterin in the bile was very low. This is thought to indicate that the body has not the power to synthesize cholesterin, but that the reserve supply in the liver is utilized as long as possible to maintain the normal amount in the blood.

The digestion and absorption of protein, K. KUGLER (*Ztschr. Biol., 69 (1919), No. 10–11, pp. 437–494, figs. 3*).—The digestion and absorption of proteins were studied as follows:

Dogs which had fasted for 24 hours were fed meat of known composition, and at intervals of 2, 4, 8, 12, 16, and 24 hours 2 of the animals were killed, the upper and lower ends of the alimentary canal were ligatured, the canal removed, the stomach, small intestines, cecum and colon ligatured and separated, and the contents of each weighed and analyzed for moisture, ash, fat, fatty acid, lecithin, total nitrogen, nitrogen in the form of protein, and proteose, peptones, residual nitrogen, and lecithin nitrogen. The results obtained are submitted in tables and curves and discussed in detail.

The nitrogen figures show that in the stomach the nitrogen is almost entirely in the form of protein, very little change in relative amounts taking place from hour to hour until the stomach is practically empty at the end of about 12 hours. In the small intestine there is very little protein and a relatively large amount of polypeptids and further decomposition products. The amount of the latter decreases toward the end of the time. In the large intestines the relative amount of polypeptids is smaller and protein larger than in the small intestine, indicating that absorption has taken place in the small intestine, and that the remaining protein represents the undigested residue.

The effect of adrenalin, desiccated thyroid, and certain inorganic salts on catalase production, W. E. BURGE (*Amer. Jour. Physiol., 50 (1919), No. 1, pp. 165–173, figs. 4*).—Continuing the catalase studies previously noted (E. S. R., 41, p. 171), the author reports that the introduction into the alimentary tract of relatively small amounts of water (15 cc.), of sodium chlorid (1. gm.), and of urea (2 gm) per kilogram produces no increase in catalase, while the introduction of large amounts (1,500 cc., 10 gm., and 10 gm., respectively) does produce an increase in catalase. It is pointed out that this is in keeping with the observations of Lusk and Riche (E. S. R., 28, p. 866) that small amounts of these substances produce no increase in oxidation, and of Tangl (E. S. R., 26, p. 465) and others that large amounts produce an increase in oxidation.

"The injection of adrenalin into the portal vein stimulates the liver to an increased output of catalase. This fact suggests that the increased amount of adrenalin thrown into the circulation during combat may stimulate the liver to an increased output of catalase, and in this way aid in bringing about the increase in oxidation occurring during combat.

"Desiccated thyroid when introduced into the alimentary tract stimulates the liver to an increased output of catalase. This observation suggests that the increase in the catalase of the blood, which may be responsible for the increase in the respiratory exchange of an animal when fed with thyroid or in exophthalmic goiter, is probably due to the stimulation of the liver to an increased output of catalase."

Some data concerning the alleged relation of catalase to animal oxidations, R. L. Stehle (*Jour. Biol. Chem., 39 (1919), No. 2, pp. 403–419*).—"Data are presented which indicate that the feeding of meat and the administration of saccharin, β-hydroxybutyric acid, alanin, and glycin are not accompanied by an increase in the catalase content of the blood to the extent reported by Burge. The increases which were noted were rather slight.

"An explanation is suggested for the variations in catalase content of the blood which is supported by experimental evidence. According to this explanation fluctuations in catalase content are due to fluctuations in the number of red cells in the blood. Consequently it is simpler to regard catalase content as a function of the number of red cells than to assume a direct relation between catalase and biological oxidations."

The catalases of the blood during anesthesia, S. P. Reimann and C. E. Becker (*Amer. Jour. Physiol., 50 (1919), No. 1, pp. 54–56*).—Estimations of the catalase content of the blood before and after anesthesia are reported, showing a decrease in 65 per cent and an increase in 35 per cent of the cases in which the most consistent results were obtained. The authors report the same difficulties in technique and in obtaining consistent results that Becht mentions (E. S. R., 41, p. 172), and agree with him that, contrary to the conclusions of Burge, the results obtained in catalase observations can have no weight in physiological deductions.

The effect of pyretics and antipyretics on catalase production, W. E. Burge (*Jour. Pharmacol. and Expt. Ther., 14 (1919), No. 2, pp. 121–130, figs. 3*).—A further contribution to the study of catalase is presented and summarized as follows:

"Tetrahydro-β-naphthylamin, adrenalin, caffein, and sodium chlorid stimulate the alimentary glands, particularly the liver, to an increased output of catalase, which is offered in explanation of the increased oxidation produced by these substances and hence for the accompanying fever in so far as the increased heat production is involved in this.

"Chloroform decreases catalase, both by decreasing its output from the liver and by direct destruction of this enzym. Ether decreases catalase, principally by direct destruction of the enzym without disturbing the liver function so much as does chloroform. Acetanilid, quinin, and phenacetin produce a slight decrease in catalase by decreasing its output from the liver.

"Chloroform and ether lower temperature in so far as decreased oxidation is involved in this by decreasing catalase, the enzym principally responsible for oxidation in the body. The fact that acetanilid, quinin, and phenacetin have little or no effect in decreasing catalase suggests that their mode of action in lowering temperature is not due to a decrease in oxidation."

Animal calorimetry.—XVI, The influence of lactic acid upon metabolism, H. V. Atkinson and G. Lusk (*Jour. Biol. Chem., 40 (1919), No. 1, pp. 79–89*).—Continuing the studies on animal calorimetry previously noted (E. S. R., 41, p. 171), the authors have investigated the effect of lactic acid upon heat production in a dog.

In the course of the study it was found that the injection of a large volume of liquid (500 cc.) increases heat production about 1 calorie per hour above the basal level. After allowing for this factor the increased heat production, after giving 8 gm. of *d-l*-lactic acid, was 2.1 calories in one experiment and 1 calorie in another, results which are comparable with 1.5 calories obtained after giving 8 gm. of *d-l*-alanin. Following the administration of 8 gm. of glucose in 150 cc. of water there was no increase whatever in basal metabolism. This is thought to indicate that neither lactic acid nor alanin is produced in appreciable quantities from ingested glucose.

The calcium requirement for man and animals, O. Loew (*Der Kalkbedarf von Mensch und Tier. Munich: Otto Gmelin, 1919, 2. ed., rev. and enl., pp. 107, figs. 2*).—The second edition of this volume consists of the following chapters: The function of calcium in life processes; the calcium content of human food; results of calcium deficiency; benefits from the addition of calcium to the diet; the calcium requirement during pregnancy and menstruation; calcium in therapy; and the calcium requirement for domestic animals.

The bacteriologic analysis of the fecal flora of children, G. B. Morris, R. L. Porter, and K. F. Meyer (*Jour. Infect. Diseases, 25 (1919), No. 5, pp. 349–377, figs. 2*).—This article contains the description and interpretation of the bacteriological methods employed in an investigation previously noted (E. S. R., 42, p. 165) in the examination of fecal specimens of children apparently suffering from intestinal intoxication. The main characteristics of normal, putrefactive, and fermentative stools are described and illustrated by analyses of representative samples of the three types, and the possibilities of altering the intestinal flora by suitable diet are discussed.

Notes on Bacillus botulinus, G. S. Burke (*Jour. Bact., 4 (1919), No. 5, pp. 555–570, pls. 3, figs. 2*).—This paper describes the methods employed by the author in the production of botulinus antitoxin for laboratory purposes, and in the isolation of *B. botulinus* from the contents of cans of spoiled food and from manure, intestinal contents, etc.

The general cultural characteristics of *B. botulinus* are also described and summarized. The strains studied by the author fall into two distinct types, A and B, each of which neutralizes the toxin of its own type but not of the heterologous type. The strains of type A usually produce a stronger toxin in broth than those of type B, but otherwise no difference has been noted in cultural characteristics or morphology. Of the strains examined, type A was predominant in the Pacific Coast States and type B in other localities.

The occurrence of Bacillus botulinus in nature, G. S. Burke (*Jour. Bact., 4 (1919), No. 5, pp. 541–553*).—The author reports the examination for the presence of *B. botulinus* of samples covering a wide range of material collected in five rather widely separated localities in central California. The method used in examining the material consisted in making cultures in an oil-stratified, double strength, beef-infusion broth with 2 per cent glucose and a reaction as nearly neutral as possible, incubating the cultures at 28° C. for from 2 to 6 months, and then testing for toxin by subcutaneous injection into guinea pigs of 1 cc. of the filtered culture. Each filtrate which killed a guinea pig in 48 hours or less was tested against antitoxins of *B. botulinus* types A and B.

Of the 235 cultures made, 7 containing *B. botulinus* were found. Type A was found in bruised and moldy cherries, bird-pecked cherries, slightly scarred bush beans, and discolored moldy hay from an outdoor stack, and type B in pole bean leaf covered with spots or insect droppings, spiders from bush bean plants, and manure from a hog which had recovered from botulism 8 months before the sample was taken. In addition to the positive cultures, four doubtful cultures were obtained from spiders, spider webs, and small bugs.

From the results obtained in this survey the author draws the conclusions that *B. botulinus* is widely distributed in nature, is present in the garden and may be on the fruit or vegetables when they are picked, and is not necessarily associated with active decay. The evidence is also thought to indicate that *B. botulinus* may remain in the intestinal tract of an animal for at least 4 months after contaminated food had been eaten, that it may not occur far from the habitation of man, as of the five localities visited the only one which failed to give positive results differed from the other four in being isolated and deserted, and that it may be closely associated with or disseminated by spiders or insects common in gardens in California.

Spoiled canned foods and botulism, G. S. BURKE (*Jour. Amer. Med. Assoc., 73 (1919), No. 14, pp. 1078, 1079*).—The author criticizes the report of Weinzirl previously noted (E. S. R., 40, p. 764), on the following grounds:

(1) The use of the term "commercial" is considered to be too restricted and misleading. In the author's opinion, the term "commercial" is synonymous with factory-canned foods as opposed to home-canned foods, and should not be restricted to refer only to those factory-canned foods in which no spoilage has been detected and which are still being offered for sale.

(2) The statement of Weinzirl that *Bacillus botulinus* is not found in unspoiled factory-canned goods is considered unjustifiable, because too small a percentage of cans was examined, no tests were made for the specific botulinus toxin to substantiate the bacteriological findings, and no data were given as to the length of time elapsing between the processing of the cans and the making of the bacteriological examinations or as to the age of the commercial samples.

In conclusion the evidence is summarized, which, in the author's mind, justifies the assumption that there is a decided possibility of *B. botulinus* being present in factory-canned products, and that some of these cans will reach the consumer. A plea is made that all cases of food poisoning attributed to factory-canned products be investigated, with the object of proving conclusively whether or not the poisoning is due to the toxin of *B. botulinus* or to some other definite substance.

"Spoiled canned foods and botulism," J. WEINZIRL (*Jour. Amer. Med. Assoc., 73 (1919), No. 23, p. 1789*).—A reply to the criticism of Burke noted above.

Botulism, I, II (*Jour. Amer. Med. Assoc., 73 (1919), Nos. 24, pp. 1844, 1845; 25, pp. 1887, 1888*).—An editorial discussion of botulism, with particular reference to the recent contributions of Weinzirl and of Burke and their correspondence noted above.

Botulism from eating canned ripe olives, C. ARMSTRONG, R. V. STORY, and E. SCOTT (*Pub. Health Rpts. [U. S.], 34 (1919), No. 51, pp. 2877–2905, pls. 2, fig. 1*).—A detailed study is reported of an outbreak of botulism in Canton, Ohio, in which 14 cases of poisoning occurred with 7 deaths. The study includes the epidemiological investigation, the bacteriological examination of the olives and brine, the serological evidence, and the symptomatology, pathology, diagnosis, prognosis, and treatment of the disease.

The present outbreak furnished limited evidence that alcohol when given early may be of value in lessening the symptoms, probably by destroying the toxin. In the one case reported in which botulinus serum was administered four days after the onset of the disease no favorable results were obtained, but antitoxin prepared from the Boise strain was found to be protective for guinea pigs injected with toxin formed from the organism isolated from the olives.

In discussing possible means of preventing such outbreaks the authors state that the ideal of prevention would be a process of canning which effectually kills all spore-bearing organisms, but, that owing to the great resistance of certain strains of *Bacillus botulinus* to heat, there is danger that a few spores may occasionally survive almost any process of canning. The necessity is emphasized of thorough cooking of all canned goods before serving or sampling, and the rejection of all products which show even minor changes of taste, odor, or consistency.

An outbreak of botulism, C. G. JENNINGS, E. W. HAASS, and A. F. JENNINGS (*Jour. Amer. Med. Assoc., 74 (1920), No. 2, pp. 77–80*).—A report is given of an outbreak of *Bacillus botulinus* poisoning in Detroit, Mich., resulting in five deaths. The source of the toxin was a glass jar of ripe olives, from which both the bacillus and its toxin were later isolated.

ANIMAL PRODUCTION.

Problems of fertilization, F. R. LILLIE (*Chicago: Univ. Chicago Press, 1919, pp. XII+278, figs. 21*).—The author describes this volume as "an attempt to present the actual status of the various problems in a critical but not in an exhaustive manner." The successive chapters treat of the history of the problem of the fertilization of eggs, the place of fertilization in the life history of organisms, the structural changes in the egg accompanying fertilization, the physiology of the spermatozoon, the physiology of fertilization, the specificity of the attraction between sperm and egg, and the problem of why egg cells divide. Most of the conclusions are of necessity derived from experiments with marine invertebrates whose unfertilized eggs can be subjected to controlled conditions.

It is pointed out that a consistent theory of fertilization must take into account not only the maturity of the germ cells and the specificity of their reactions but also the external factors which favor or inhibit them. The experiments of the author and his students lead him to the view that a substance which he terms fertilizin is formed in the egg prior to fertilization, and that this substance is activated and initiates egg cleavage when acted upon either by a spermatozoon or by agencies which induce parthenogenesis. Fertilizin is identified with the substance in water extracts of unfertilized eggs which agglutinates suspensions of sperm of the same species, and which has some of the properties of enzyms. "Fertilization would thus be a three-body reaction between the sperm receptors, fertilizing, and egg receptors linked in line; and it is possible to show that inhibiting agencies may operate at the various linkages of such a reaction."

Heredity, J. A. THOMSON (*London: John Murray, 1919, 3. ed., pp. XVI+627, pls. 16, figs. 33*).—Aside from a complete reorganization of the chapter on heredity and sex, this edition differs only in minor details from the first (E. S. R., 20, p. 778), and is the same as the 1913 revision except for the correction of a few errors and the addition of a page to the bibliography.

The refractive index of the blood serum of the albino rat at different ages, S. HATAI (*Jour. Biol. Chem., 35 (1918), No. 3, pp. 527–552, figs. 3*).—The refractive index of the blood serum of the laboratory rat was found to increase with age, but the rate of change varied with the period of life, changes in feed, rate of growth, and health. The water content of the serum was in general inversely proportional to the refractive index.

The refractive index of the serum of males during the growing period was slightly lower and during the adult period much higher than that of females of corresponding age. The index of the serum of castrated males was distinctly higher than that of their uncastrated brothers, but spayed females gave a slightly lower index than their normal sisters.

It is held that the refractive index is not only a simple but a very sensitive test of chemical changes in body fluids.

On the composition and feeding values of several waste offals, F. Honcamp and E. Blanck (*Landw. Vers. Sta., 91 (1918), No. 1–2, pp. 93–104*).—Using a sheep, the following digestion coefficients were determined:

Digestibility of waste hulls, pods, etc.

Materials tested.	Organic matter.	Crude protein.	Nitrogen-free extract.	Crude fat.	Crude fiber.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Buckwheat hulls	16.5	6.6	24.7	100.0	8.3
Rape capsules	57.1	52.2	53.4	86.2	54.8
Corn bran	88.5	74.9	89.3	50.0	100.0
Black medick pods	53.9	49.9	47.1	51.0	68.5
Oat hulls	37.5	41.3	32.8	69.6	43.5

The proximate composition of the offals tested and the detailed data secured in the digestion trials are recorded.

Feeding stuffs report, 1917 and 1918, J. W. Kellogg (*Penn. Dept. Agr. Bul. 312 (1918), pp. 297; 327 (1919), pp. 289*).—In the 1917 report, the moisture, protein, fat, and crude fiber content and the retail prices are reported of samples of cottonseed meal, cottonseed feed, linseed meal, coconut oil meal, distiller's dried grain, brewers' dried grain, malt sprouts, corn gluten feed, hominy feed, corn bran, corn feed meal, wheat bran, wheat middlings, red dog, middlings and palm oil, rye middling, oat meal, oat feed, buckwheat middlings, alfalfa meal, dried beet pulp, various proprietary stock and poultry mixed feeds, tankage, meat scrap, meat-and-bone scrap, fish scrap, and bone meal. The 1918 report is similar to the preceding, with a like assortment of feeding materials except for the omission of malt sprouts, red dog, oat meal, and bone meal, and the inclusion of yeast and vinegar dried grains, barley middlings, barley feed, and buckwheat feed.

Live stock and dairy farming, F. D. Gardner et al. (*Philadelphia: J. C. Winston Co., 1918, pp. 196, pls. 2, figs. 86*).—This is a reprint of the sections on live stock farming and dairy farming in Gardner's Successful Farming (E. S. R., 35, p. 696).

Biotechnology of meat, fat, and milk production in large-scale farm operations, K. Ereky (*Biotechnologie der Fleisch-, Fett-, und Milcherzeugung im Landwirtschaftlichen Grossbetriebe. Berlin: Paul Parey, 1919, pp. 84*).—The purpose of the author is to acquaint persons engaged extensively in live-stock production who have had training in the natural sciences with current views as to the utilization of feeds by animals and the influence of internal secretions on body functions. Many literature references are given.

Cooperative live stock marketing, W. W. Thomson (*Saskatchewan Dept. Agr. Cooper. Organ. Branch Bul. 41 rev. (1919), pp. 32*).—This edition, called the third, differs from the one previously noted (E. S. R., 33, p. 491) in presenting an entirely new set of accounting forms, in providing more recent information about the live-stock markets of Canada, and in summarizing the existing regulations for the control of stockyards by the Dominion Government.

Results of live stock experiments (*Kansas Sta., Fort Hays Substa. [Circ. 17] (1917), pp. 6, fig. 1*).—This leaflet presents in tabular form without discussion the results of several tests of rations for beef cattle and mule colts conducted during the winters of 1915–16 and 1916–17, and was designed for the use of visitors inspecting the experimental lots during a "round up" at the substation in April, 1917. Some results of two of the experiments, viz, a 1915-16 forage test with 2-year-old heifers for 120 days, and the first two years of a study of the effect of feeding and age at first pregnancy on the development of breeding heifers, have been noted from the station's annual reports (E. S. R., 38, p. 666; 40, p. 369).

Results of a 120-day test of 5 winter rations for breeding cows, made in 1916-17, have not hitherto been noted. Twenty cows were fed each ration. Cane hay 7 lbs. and alfalfa hay 10.9 lbs. produced an average daily gain of 0.65 lb. per head. About the same gain was produced by 15.2 lbs. cane hay and 2 lbs. cottonseed cake. When half the cake of the latter ration was replaced by 14.9 lbs. sorghum silage the gain was 1.08 lbs. With no cake, the same amount of sorghum silage, and 11.1 lbs. alfalfa hay the gain was 0.76 lb.; essentially the same ration with silage of corn instead of sorghum resulted in a gain of 1.01 lbs. Each ration included about 9 lbs. of wheat straw.

The remaining data include the feed consumption of fall calves compared with spring calves, the cost of wintering calves, and the feed consumption of a group of mule colts.

Results of 1918-19 live-stock experiments (*Kansas Sta., Fort Hays Substa. Circ. 6 (1919), pp. 10, pl. 1, figs. 5*).—This publication was designed for distribution at the 1919 "round up." Besides a summary of the fourth year's results of the project dealing with development of breeding heifers and a tabulation comparing the costs of wintering heifer calves, yearling heifers, and herd bulls, data as to three tests of winter rations for pregnant beef cows are recorded. The cows were divided into lots of 20 and the records are for a period of 100 days.

Cows fed Russian thistle hay, straw, and silage lost 82 lbs. per head, while another group fed a like ration in which alfalfa hay replaced the Russian thistle lost 88 lbs. and the cost was nearly doubled. Cows fed Kafir corn silage (31.5 lbs. per head per day) and cottonseed cake (2 lbs.) lost somewhat more than those fed Kafir corn fodder (24.6 lbs.) and cottonseed cake (2 lbs.). It is estimated that one acre of Kafir corn used as fodder or 0.56 acre made into silage would provide 100 days' roughage for a cow.

A group fed corn stover (12.6 lbs.) and cottonseed cake (2 lbs.) lost somewhat more than three other groups fed, respectively, stover and linseed cake, corn silage (25 lbs.) and linseed cake, and silage and cottonseed cake. All four lots received straw. The fact that each group produced a different number of calves complicates direct comparison of the rations.

Growing beef on the farm, F. W. Farley (*U. S. Dept. Agr., Farmers' Bul. 1073 (1919), pp. 23, figs. 11*).—The author discusses the management and feeding of a beef herd. A gestation table and a number of sample rations for cows and stockers in winter and for finishing baby beef are included.

Judging beef cattle, E. H. Thompson (*U. S. Dept. Agr., Farmers' Bul. 1068 (1919), pp. 23, figs. 9*).—Directions for judging fat cattle, feeders, and breeding stock are given, including score cards.

The hides of colonial cattle, H. Boulanger (*Les Peaux des Bovidés Coloniaux. Paris: Émile Larose, 1919, pp. XII+96, pl. 1, figs. 46*).—This publication considers the dependence of the French leather industry on a supply of hides of satisfactory grade from the domesticated and semidomesticated (zebu, buffalo, etc.) cattle of French Indo-China, French West Africa, French Equatorial Africa, and Madagascar. Suggestions for bettering the condition of imported hides are included.

Comparative rations for wintering breeding ewes, S. F. Russell (*Oklahoma Sta. Bul. 125 (1919), pp. 8, figs. 2*).—Five lots of 20 pregnant ewes each were fed for 90 days beginning January 4, 1918, to test the value of 5 different rations.

Two lots whose daily ration included 0.5 lb. of cottonseed meal per head and wheat straw, with Kafir corn silage in one case and cane fodder in the other, showed symptoms of cottonseed poisoning and 3 ewes died before bran was substituted for the meal. The poisoning was somewhat more severe in the silage-fed lot. Two lots receiving half this amount of cottonseed meal, together with Kafir corn heads or ground grain and 2 lbs. of Sudan hay showed no ill effects and made the greatest growth. The Kafir corn chop proved somewhat more satisfactory than the heads. From the standpoint of costs and health, however, the most satisfactory ration was one in which about 2 lbs. of alfalfa hay per head furnished the necessary protein supplement to Kafir corn silage and wheat straw.

The goat: Its use and management, J. T. Bird (*London: W. H. & L. Collingridge, [1918], 2. ed., pp. 99, pls. 8, figs. 31*).—This volume discusses the breeds of goats occurring in England, methods of housing and feeding, the making of cheese and butter from goat's milk, the goat as a draught animal, the use of goat flesh, and the ailments of goats.

Maintenance and production value of some protein mixtures, E. B. Hart and H. Steenbock (*Jour. Biol. Chem., 38 (1919), No. 2, pp. 267–285, figs. 3*).—The authors tabulate and discuss the nitrogen intake and excretion of 54 pigs (averaging 50 lbs. each in weight) during 24-day metabolism experiments at the Wisconsin Experiment Station, with the object of comparing the availability for growth of combinations of proteins from diverse sources. Nineteen different rations were tested on groups of 2 or 3 pigs. The percentage of ingested nitrogen retained by the pigs is the measure of efficiency adopted and is termed the production value. The tables also give the percentage of absorbed nitrogen retained by each animal, but do not present average figures for each group. The plane of nitrogen intake was kept uniformly low to secure a minimum loss of protein in the excreta. With one exception the estimated available net energy of the ration equaled or exceeded the Armsby allowance of 1.38 therms per day for a 50-lb. pig.

The most extensive comparison of protein sources is provided by the series of tests in which the basal ration consisted of corn or corn and alfalfa. The following table summarizes most of the data in this series, the separate experiments being listed in the order of increasing production values of the rations used:

Nitrogen metabolism of pigs fed corn, or corn and alfalfa, plus a protein supplement.

Number of pigs.	Ratio of corn to alfalfa.	Supplement fed.	Available energy of ration.	Protein in ration.	Nitrogen ingested per day.	Proportion of ingested N.			Ingested N retained.[1]	Absorbed N retained.[2]
						From corn.	From alfalfa.	From supplement.		
			Therms.	*Per ct.*	*Gm.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
2	1:0	Linseed meal	1.69	12.6	12.1	52	....	48	24.8	35.2
3	11:5	Gluten feed	1.54	15.1	16.9	38	30	32	28.0	42.8
3	3:1	None	1.36	12.4	11.9	64	36	....	31.7	49.3
3	2:1	Tankage	1.48	15.0	16.8	35	30	35	37.7	61.0
3	3:1	Whey	1.58	12.2	16.3	54	30	16	39.1	63.0
3	1:0	Tankage	1.55	17.3	16.7	62	....	38	40.3	57.4
3	12:5	Skim milk	1.50	15.1	16.6	43	30	27	41.5	62.1
3	4:1	Whey	1.99	11.8	16.8	50	20	30	44.6	62.9
3	1:0	Skim milk	2.09	13.0	16.4	72	....	28	61.7	71.8

[1] Group averages.

[2] Median value of group.

The other experiments also showed high production values when milk products were used, intermediate values with animal by-products, and low values when the entire ration was of plant origin. When barley furnished 62 and tankage 38 per cent of the nitrogen, the production value was 39.7. When all the nitrogen was derived from either meat "crisps" or fish scrap (the balance of the ration being starch), the average production value in the first case was 39.5 and in the second 41.8. The production value of a mixture of corn, corn gluten feed, and whey (with 15 per cent of the nitrogen from the latter) was 45.1, and that of skim milk (27 per cent of the nitrogen), rolled oats, and corn starch was 66.7, the highest value observed. The protein plane of this oats ration was only 13.4 per cent, but the energy available was 3.12 therms a day, which was over a therm higher than any other ration tested. In three of the rations 64 per cent of the nitrogen came from a mixture of rice, wheat, corn, potatoes (sliced and steamed), and uncooked cabbage, and the rest from either wheat gluten or meat "crisps" or skim milk. With these three supplements the rations were, respectively, 19.4, 32.7, and 47.0 per cent efficient.

That the defects of mixtures of plant proteins are not due to lack of vitamins or mineral matter is indicated by one of the experiments in which the addition of butter fat, calcium lactate, and sodium chlorid to a corn and linseed meal ration failed to increase the production value. The authors promise more data on the efficiency of flaxseed proteins in a later paper.

The lowered production values of rations containing alfalfa as shown by the table is attributed chiefly to the elimination of nitrogen with the fecal residues. This fact is not considered a valid argument in favor of basing production values on absorbed instead of ingested nitrogen. "The proteins are always fed in company with the other constituents of the natural material, and if these modify the amount of total nitrogen left to the organism, as is the case where variable amounts of fiber are ingested, then it would seem to us that this fact must be considered in arriving at the production value of any protein mixtures as it occurs in natural feeds." It is not the claim of the authors that the production value is the only factor to be considered in planning a ration, and they point out that a ration of corn meal and milk despite its high production value would terminate the life of a growing pig in a few months.

The acid-base balance in animal nutrition, I–II, A. R. Lamb and J. M. Evvard (*Jour. Biol. Chem., 37 (1919), No. 2, pp. 317–342*).—The experiments reported in these two papers were conducted at the Iowa Experiment Station and were initially planned to test the ability of swine to metabolize the lactic and acetic acids of silage, particularly of ensiled rape previously studied by the authors (E. S. R., 35, p. 768).

I. *The effect of certain organic and mineral acids on the growth, well being, and reproduction of swine* (pp. 317–328).—Four lots of two 60-lb. pigs each were fed the same basal ration of corn, middlings, and tankage (16:1:3) and 3 of the lots after a 30-day check period received sulphuric, lactic, and acetic acids, respectively, for 150 days in amounts up to 500 cc. of a normal solution per pig per day. Throughout the initial check period and the first 120 days of acid feeding the same amount of feed was consumed by each lot. The average daily gains of the acid-fed lots during this interval were, respectively, 1.1, 1.08, and 1.14 lbs. per head, while the pigs in the control lot gained 1.13 lbs. daily. The acid-fed pigs also remained in as good condition as the control pigs.

The pigs apparently oxidized the organic acids completely, as early morning samples of urine contained no more ammonia than the urine of the control pigs. The H-ion concentration of the blood of the acid-fed individuals toward the end of the experiment was found to be the same as that of the controls.

Following the experiment, 2 of the gilts were continued on the basal ration plus 500 cc. of N sulphuric acid until after they had farrowed, 3 and 5 months later. The young were vigorous, suckled normally, but only 1 of the 11 was reared successfully. The authors do not believe that the deaths of the young can with certainty be ascribed to the acid feeding.

II. *Metabolism studies on the effect of certain organic and mineral acids on swine* (pp. 329–342).—A vigorous 90-day old barrow pig weighing 60 lbs. was put in a metabolism cage and given the above mentioned basal ration (rich in calcium) for 10 days and then in three successive 10-day periods received in addition to this ration N lactic, N sulphuric and N acetic acid, respectively, in daily doses of 250 to 300 cc. Following these was another check period. The calcium (oxid) intake was 10.17 gm. per day, and the daily calcium balances were +3.42 gm. with lactic acid, +2.58 gm. with sulphuric acid, +3.58 gm. with acetic acid, and +3.28 gm. when no acid was given. The organic acids were oxidized completely without increase in urinary ammonia. Of the sulphuric acid ingested 61 per cent was accounted for by increased ammonia excretion, while 5 per cent was excreted as phosphates (excess urinary acidity).

A second sulphuric acid experiment was conducted with a calcium-poor basal ration of ground corn plus 5 per cent of a blood preparation known as black albumin. Aside from the mineral content this was a suitable ration, the protein percentage being 12.75. With a daily calcium intake of 0.46 gm., the calcium balance was —0.69 gm. during acid feeding, —0.72 gm. during the preliminary check period, and —0.14 gm. during the final check period. Extra ammonia excretion accounted for 76 per cent of the acid ingested and increased urinary acidity for 10 per cent.

In none of the acid feeding periods was nitrogen storage interferred with.

Effect of feeding peanuts on the quality of pork, C. T. DOWELL and W. G. FRIEDEMANN (*Oklahoma Sta. Bul. 124* (*1919*), *pp. 8*).—The authors report the iodin numbers and melting points of samples of the kidney fat and back fat of 100-lb. hogs used in feeding tests in 1916 and 1918.

In 1916, 5 lots of hogs were fed 70 days, and a hog from each lot was used in determining the fat constants. Packing-house records as to the shrinkage of hams and belly of another hog in each lot are also given. The iodin numbers were highest, the melting point lowest, and the shrinkage greatest in a lot fed peanuts alone. Two lots fed peanuts for 40 days only and then finished in one case on corn and tankage (23:2) and in the other on Kafir corn and tankage (23:2) showed high iodin numbers, relatively low melting points, and considerable shrinkage. The other two lots received no peanuts, one being fed oats, shorts, barley, and buttermilk (1:1:2:8) and the other corn chop, Kafir corn chop, cottonseed meal, and tankage (11:11:2:1). From the standpoint of firmness of flesh and low shrinkage, the last-named ration was the most satisfactory one tried in 1916.

In the 1918 trials there were 6 lots of 8 hogs. The length of the feeding period is not stated. A small amount of alfalfa was given each lot, and the following concentrates were offered unmixed in self-feeders to the lots indicated by the numerals: (1) Corn, tankage; (2) darso, tankage; (3) Kafir corn, tankage; (4) Kafir corn, peanut meal; (5) Kafir corn, cottonseed meal; (6) Kafir corn, tankage, peanut meal, cottonseed meal. The lots are listed in the order of decreasing iodin numbers of both back and kidney fat, and also in the order of increasing melting points except that lot 4 ranked next to lowest. Lot 4 consumed a larger proportion of peanut meal than lot 6.

Finishing pigs for market, E. J. FJELDSTED and E. L. POTTER (*Oregon Sta. Bul. 165* (*1919*), *pp. 15*).—Summaries are presented of a large number of experiments conducted by the main station at Corvallis and the eastern Oregon substation at Union, to test the value of various feeds in bringing 100-lb. pigs to the usual Oregon market weights of 175 to 225 lbs. Reference is also made to pertinent results secured by stations in other States.

After brief discussions of the utility of grinding, soaking, and cooking the feeds and the relative advantages of hand feeding, self-feeding, and free-choice system, and hogging down, the authors devote a separate paragraph to each of the feeding stuffs that they desire to consider. These include barley, wheat, corn, wheat by-products, oats, rye, peas, skim milk, buttermilk, whey, tankage, coconut meal, linseed meal, soy bean meal, alfalfa hay, potatoes, roots, artichokes corn silage, molasses, and alfalfa pasture. In some cases only qualitative results are given, but generally in the discussion of a particular feed or feed mixture the authors indicate the average daily gain secured, the amount of feed consumed per unit gain, and the number of tests on which these averages are based. Regarding further details of the Oregon experiments, it is stated that full information concerning them will be furnished on request.

Pig keeping on money-making lines, W. Powell-Owen (*London: G. Newnes, Ltd., 1917, pp. 156, figs. 14*).—This is an elementary statement of the principles of swine production as they apply to the British Isles.

The pig, R. Gouin (*Le Porc. Paris: Libr. Agr. Maison Rustique, 1918, pp. 160, figs. 17*).—This brochure contains considerable information about the classification, feeding, and hygiene of swine, and the production and marketing of pork.

Commercial poultry raising, H. A. Roberts (*Philadelphia: David McKay, 1918, pp. XIX+582, figs. 341*).—The author treats in considerable detail of the problems of the commercial poultry keeper, giving particular attention to housing and marketing. The production of eggs and of table fowl are both considered.

Profitable poultry keeping, E. T. Brown (*London: C. A. Pearson, Ltd., 1918, pp. 130, pls. 4, figs. 36*).—A manual designed for small holders.

The hen at work, E. Cobb (*New York and London: G. P. Putnam's Sons, 1919, pp. VIII+233, pls. 16, figs. 19*).—A book designed primarily for persons raising poultry on a small scale under urban conditions.

Rational feeding of poultry, W. Chenevard (*Alimentation Rationale des Volailles. Paris: J. B. Baillière & Sons, 1919, pp. 132, figs. 14*).—This volume is chiefly an exposition of the principles of feeding and fattening poultry for market in France. Not only chickens but ducks, geese, turkeys, partridges, and pigeons are considered.

Originating and standardizing a new variety of Cornish, W. H. Card (*Rel. Poultry Jour., 26 (1919), Nos. 7, pp. 647, 672, figs. 2; 8, pp. 725, 748, 749, figs. 3; 9, pp. 817, 857, 858, figs. 2; 10, pp. 927, 975, 976, fig. 1*).—This is a history of the establishment of the White Laced Red variety of Cornish fowl, written by its originator.

Culling the poultry flock (*U. S. Dept. Agr., Dept. Circ. 31 (1919), pp. 4, fig. 1*).—The physical characteristics supposed to indicate productivity in hens are listed and discussed.

Increase in egg production in the winter season, W. H. Graham (*Ontario Dept. Agr., Ann. Rpt. Agr. and Expt. Union, 40 (1918), pp. 48–55*).—Egg records of hens belonging to the Ontario Agricultural College are cited to show the increased production resulting from artificial lighting in winter, and the increased winter production of blood lines derived from progeny-tested males.

Points for egg buyers (*U. S. Dept. Agr., Dept. Circ. 25 (1919), pp. 11, figs. 12*).—This leaflet describes the defects in eggs as revealed by candling, illustrates several candling devices, and presents directions for making a portable electric egg candle.

Practical rabbit keeping, E. I. Farrington (*New York: R. M. McBride & Co., 1919, pp. VII+168, pls. 8, figs. 5*).—Besides chapters on breeding and caring for rabbits, this volume includes brief discussions on rabbits as meat and fur producers.

DAIRY FARMING—DAIRYING.

Farm dairying, C. LARSEN (*New York: Orange Judd Co., 1919, pp. XII+315, figs. 117*).—This treatise deals with the breeds, feeding, and management of dairy cattle, and the production of milk for direct human consumption, for making farm butter and cheese, and for creamery butter. Considerable attention is given to machine milking and the use of calf meals.

Dairying, G. FASCETTI (*Caseificio. Milan: Ulrico Hoepli, 1918, 2. ed. enl., pp. XXXII+685, figs. 113*).—This is a revised edition of a treatise (E. S. R., 25, p. 176) on the milk, cream, butter, and cheese industries in Italy, to which is added a section on the making of casein and other skim milk by-products.

Thirtieth, thirty-first, and thirty-second annual reports of the Bernese Dairy School at Rütti-Zollikofen, A. PETER ET AL. (*Jahresber. Molk. Schule Rütti-Zollikofen, 30 (1916–17), pp. 52, pl. 1; 31 (1917–18), pp. 58; 32 (1918–19), pp. 58, pl. 1*).—These are somewhat abbreviated reports of the activities of the school, together with tabulated analytical data secured in the routine examination of milk received and cheese produced. There are included in the thirtieth report two notes on the mechanics of cream separators, in the thirty-first two papers on cheese from skim or partially skimmed milk, and in the thirty-second a paper on the computation of butter yield.

Previous reports have been noted (E. S. R., 36, p. 571).

How to feed the dairy cow, H. G. VAN PELT (*Waterloo, Iowa: Fred. L. Kimball Co., 1919, pp. 290, pls. 10, figs. 57*).—A reprint of a series of articles from *Kimball's Dairy Farmer.*

The cost of milk production in the district of Montreal, H. BARTON (*Jour. Agr. and Hort., 22 (1919), No. 11, p. 199, fig. 1*).—This article cites average cost data collected by Macdonald College, Quebec, from 22 Ontario and Quebec farms supplying milk to the Montreal district. To produce 100 lbs. of milk required 50 lbs. of grain, 214 lbs. of succulent roughage, 123 lbs. of hay, and 4 hours of labor. During the summer the 423 cows milked averaged 22 lbs. of milk each per day, and during the winter 321 cows averaged 16 lbs.

The composition of Egyptian cow milk, G. HOGAN and A. AZADIAN (*Dept. Pub. Health Egypt, Rpts. and Notes Pub. Health Labs., No. 1 (1917), pp. 31–36*).—As part of a general study of the composition of the milk of Egyptian mammals (E. S. R., 35, p. 276), the authors tabulate analyses and refractometer readings of 149 samples of the milk of individual cows. The average amount of milk secured in a milking was 2.6 liters (2.7 qts.). The mean fat percentage was 5.44, and the mean percentage of solids-not-fat 9.19.

The composition of Egyptian goat milk, G. HOGAN and A. AZADIAN (*Dept. Pub. Health Egypt, Rpts. and Notes Pub. Health Labs., No. 1 (1917), pp. 39–42*).—Analyses and refractive indices of 104 samples of the milk of individual goats are tabulated. The fat averaged 4.04 and the solids-not-fat 8.5 per cent.

Practical buttermaking, C. W. WALKER-TISDALE and T. R. ROBINSON (*London: Headley Bros., Ltd., 1919, 4. ed., rev., pp. 143, pls. 13, figs 20*).—Directions for making dairy butter and a brief exposition of the theory of butter making are given in this volume, which was first issued in 1903. A chapter is devoted to the utilization of skim milk and buttermlk by calves, pigs, and poultry.

Cheese making, J. W. DECKER, rewritten by J. L. SAMMIS (*Madison, Wis.: Mendota Book Co., 1918, 6. ed., pp. 225, figs. 60*).—This edition resembles the fifth (E. S. R., 20, p. 1181) chiefly in format and the use of many of the old figures. The text has been entirely reorganized. The questions at the end of chapters and much of the elementary matter on milk are omitted, and the discussions of Cheddar, Swiss, Limburger, brick, and Edam cheese have been rewritten and much condensed. On the other hand, more space is given to Neufchatel cheese and other varieties, chapters on the manufacture of casein and on cured cheeses from sour milk curd are added and several new chapters are devoted to problems of factory management and the marketing of cheese.

Practical cheese making, C. W. Walker-Tisdale and W. E. Woodnutt (*London: Headley Bros., Ltd., 1917, pp. 7, figs. 17*).—This is a handbook for British cheese makers. The varieties of cheese considered are Cheddar, Cheshire, Leicester, Derby, Caerphilly, and Wensleydale. There is also a chapter on whey butter.

The practice of soft cheese making, C. W. Walker-Tisdale and T. R. Robinson (*London: J. North, 1918, 4. ed. rev., pp. 5–106, pls. 8, figs. 11*).—This volume, first published in 1903, is a guide to the manufacture of soft cheeses, particularly as an adjunct to the dairy. The varieties treated include cream, double cream, rennetted cream, Gervais, Bondon, Coulommier, Cambridge, sour milk, Pont-l'Evêque, Camembert, little Wensleydale, Colwick, little Lancashire, Pont-du-Salut, and goat's milk cheese. One chapter deals with the preparation of cream for market, and includes short notes on potted cream and Devonshire clotted cream.

A broader field for the creamery, B. H. Rawl (*Hoard's Dairyman, 58 (1919), No. 19, pp. 869, 880, 881, fig. 1*).—The author expects that the old type of factory devoted entirely to butter making will be replaced by a plant manufacturing food products from all the milk solids.

VETERINARY MEDICINE.

On the mechanism of immunization, J. A. Shaw-Mackenzie (*Lancet [London], 1919, II, No. 19, pp. 825–827*).—The author refers to the article by Wright on therapeutic immunization previously noted (E. R. S., 41, p. 187), and states his belief that the fat splitting enzym "plays an important rôle in treatment by autogenous vaccines whether injected into the tissues or intravenously. Vaccines and antitoxic sera in vitro increase the fat-splitting properties of pancreatic extracts in varying degree. Their action in this direction is less than that of serum, and their antitryptic power is small or absent. In the process of sterilization by heat the bacterial enzyms are destroyed, but even 100° C. is not destructive to the thermostable activating material which they contain. From this point of view part of the value of the vaccine must be due to this material, and its power to increase fat-splitting is a factor in its protective mechanism." Experimental evidence is given in support of this theory.

Attention is also called to the work of Jobling along the same lines (E. S. R., 35, p. 881).

Methods of choice in immunity, A. G. Shera (*Lancet [London], 1919, II, No. 21, pp. 909–914, figs. 12*).—To throw light on the comparative values of the various methods of vaccine therapy commonly employed, a detailed study is reported of a number of cases of streptococcal infection treated in different ways. Existing methods of immunizing against the streptococcus are summarized as follows: A, with a serum alone; B, with a serum, followed after a short interval by a full dose of vaccine; C, by a serum in the acute stages, followed by a vaccine when the subacute stage has been reached; D, with vaccine alone; and E, by immunization in vitro as recommended by Wright (E. S, R., 41, p. 187).

Of the cases recorded, 10 were treated by method A, 3 by B, 4 by C, 3 by D, and none by E. The principle followed was to avoid vaccines unless antiserum was also present or, to follow the author's axiom, "against an exotoxin a serum should be employed, against an endotoxin a vaccine, and against a combination of both exo- and endo-toxin both a serum and a vaccine should be used."

Out of the 20 cases reported there were 14 unequivocal successes, including 2 cases of well-defined septicemia. The results obtained indicated that to get the best results method B should be followed, although in very toxic cases method A (serum alone) should be the choice. Vaccine alone was found to be without value in wound infections in which sequestra and foreign bodies were present. Attention is called to the danger of anaphylaxis in cases which have previously had serum. In such cases a small dose of the serum followed by an interval of several hours for development is recommended.

Contributions to the biochemistry of pathogenic anaerobes.—VIII, The biochemical comparison of microorganisms by quantitative methods, J. E. G. Harris (*Jour. Path. and Bact., 23 (1919), No. 1, pp. 30–49, figs. 2*).—In this paper, which is in continuation of the studies on the biochemistry of pathogenic anaerobes by Wolf and Harris (E. S. R., 41, p. 476), a comparison is made between two closely related organisms *Bacillus sporogenes* and the Reading bacillus isolated by Donaldson and Joyce (E. S. R., 40, p. 678). The comparison was made by means of quantitative determinations of the proteolytic and sugar-splitting properties of the organisms in a series of parallel fermentations on different media, and of the oxygen concentrations which permit or inhibit growth of these organisms. Details are given of the apparatus and methods employed in all the determinations.

The degree of oxygen tolerance was determined by inoculating a number of tubes of medium with the organism under question, removing the air from the tubes by means of a pump, and replacing it by oxygen at definite pressures. The limits within which growth takes place are expressed as the "aerobic index." This is composed of the partial pressures of oxygen in the extreme tubes showing growth, that of the tube containing the higher pressure of oxygen being written over that containing the lower pressure in the form of a fraction. In order to show the degree of accuracy to which the determinations have been made, the value of the intervals between two determinations is written after the index.

From the experimental results obtained, the conclusion is drawn that the two organisms compared are practically identical in their biochemical reactions with the exception of their behavior toward oxygen. The aerobic indices in peptone water were found to be 600/0 (50 mm.) for *B. sporogenes* and 0/0 (50 mm.) for the Reading bacillus. On agar slopes an aerobic index of 0/0 (50 mm.) was obtained for both. This difference in behavior toward oxygen is thought to be possibly an acquired tolerance due to extensive subcultivation.

On the distribution of the nonprotein nitrogen in cases of anaphylaxis and peptone poisoning, K. Hisanobu (*Amer. Jour. Physiol., 50 (1919), No. 3, pp. 357–363*).—In an attempt to throw light upon the nature of anaphylaxis, the author has determined the distribution of the nonprotein nitrogen in the blood of guinea pigs under normal conditions, after intraperitoneal injection of peptone, and after the production of anaphylactic shock.

Both peptone intoxication and anaphylaxis were associated with a marked increase in urea nitrogen, and a greater or less increase in nonurea and amino nitrogen, the changes being even more marked in anaphylaxis than in the peptone poisoning.

"Anaphylaxis as well as peptone intoxication leads to an abnormally rapid autodigestion of tissue protein. The causative factors, as yet undetermined, are probably the same in both cases."

Hydrogen-ion concentration and antiseptic potency, with special reference to the action of acridin compounds, C. H. Browning, R. Gulbransen, and E. I. Kennaway (*Jour. Path. and Bact.*, *23* (*1919*), *No. 1*, *pp. 106–108*).—Comparatively small variations in H-ion concentration have been found to exert a great influence on the antiseptic potency of acridin compounds, a lowered H-ion concentration enhancing the antiseptic power. It is concluded that the effectiveness of the acridin antiseptics in serum (E. S. R., 41, p. 188) may be ascribed mainly to two factors, the H-ion concentration of the serum and the lack of combination of a chemical or physical character between the acridin compounds and constituents of the serum.

Attention is called to the importance, in the practical testing of an antiseptic, of taking into account the H-ion concentration of the medium in which it is tested.

Notes on surgical work in a general hospital, with special reference to Carrel-Dakin's method of treatment, J. S. Dunne (*Jour. Roy. Army Med. Corps*, *33* (*1919*), *No. 1*, *pp. 58–66*).—This is a brief report on the value of various antiseptics in the treatment of surgical wounds as determined by actual practice in a general hospital at a port of embarkation. By far the best results were obtained with Carrel-Dakin's dressings, good results generally with flavin, and unsatisfactory results with Bipp and salt-pack dressings.

The use of "lysoclor" for the treatment of wounds and parasitic conditions, R. Middeldorf (*Berlin. Tierärztl. Wchnschr.*, *34* (*1918*), *No. 14*, *pp. 134–136*).—Lysoclor, a commercial disinfectant consisting of dichlorbenzene rendered soluble by combination with a special soap after a patented method, has been found by the author to be very successful in the treatment of mange and other parasitic infections and of infected wounds. The disinfectant, which is generally used as a 5 per cent emulsion, is said to have no marked odor but strong deodorizing properties. It has no toxic effect upon the skin or mucous membranes and does not discolor instruments. Wounds treated with the emulsion are said to heal quickly.

Shell wounds and their treatment with 10 per cent sodium chlorid solution, R. Middeldorf (*Berlin. Tierärztl. Wchnschr.*, *34* (*1918*), *No. 32*, *pp. 311–314*).—The author reports remarkable success in the treatment of war wounds with 10 per cent sodium chlorid solution. The treatment is followed by rapid destruction of bacteria, deodorization of the wound, sloughing off of necrotic tissues, and quick and healthy granulation.

Glanders, G. H. Conn (*Amer. Jour. Vet. Med.*, *14* (*1919*), *No. 12*, *pp. 590–594*, *figs. 5*).—Data are given of the results obtained with the ophthalmic and complement fixation test for glanders at an Army remount containing nearly 12,000 horses and mules.

Of the total of 197 reactors to all tests and physical examinations, 42 per cent were discovered by the ophthalmic test, 49 per cent by the complement fixation test, and 9 per cent by clinical symptoms. On post mortem examination, 89 per cent proved positive, 8 per cent suspicious, and 6 per cent negative. The post mortem examination also indicated that glanders was more acute and more common in the mule than in the horse.

The pathology and diagnosis of glanders, W. Pfeiler (*Berlin. Tierärztl. Wchnschr.*, *34* (*1918*), *No. 10*, *pp. 96–98*).—This is a critical discussion of conflicting views as to the relative merits of the complement deviation and mallein tests for the diagnosis of glanders.

Contribution to the complement deviation test for glanders, J. Rudolf (*Berlin. Tierärztl. Wchnschr.*, *34* (*1918*), *No. 38*, *pp. 371*, *372*).—Evidence is given to indicate that positive results in the complement deviation test often obtained with glanders-free horses, mules, etc., may be prevented and the test rendered a more certain indication of glanders by heating the sera to 63 or 64° C., for from 30 to 40 minutes. This has been found to destroy the anticomplementary bodies which are the cause of positive reactions in healthy animals, but to have no effect upon the specific complement deviating bodies.

The importance and value of a physical examination for the diagnosis of bovine tuberculosis, L. PANISSET (*Rev. Gén. Méd. Vét., 28 (1919), No. 334, pp. 550–553*).—The importance is emphasized of supplementing the tuberculin test in cattle with a thorough physical examination. This is considered especially important in revealing cases in which the tuberculination coincides with the intermediate periods in which animals decidedly tuberculous cease to react to tuberculin.

The intradermal tuberculin test, C. ACKLEY (*Amer. Jour. Vet. Med., 14 (1919), No. 12, pp. 588–590, figs. 4*).—The author discusses briefly advantages in the intradermal tuberculin test over the subcutaneous in respect to speed, accuracy, and expense, and recommends the test for swine. In a recent test of 108 head of swine ranging from 3 to 6 months' old and 21 mature hogs, 8 animals reacted to the intradermal test and all of these showed lesions on post mortem examinations.

Tuberculosis in live stock: Detection, control, and eradication, J. A. KIERNAN and A. E. WIGHT (*U. S. Dept. Agr., Farmers' Bul. 1069 (1919), pp. 31, figs. 21*).—This is a popular summary of information on tuberculosis in live stock. It is pointed out that the affection may be introduced into a healthy herd by an animal from a diseased herd, by feeding calves with dairy products from tuberculous cows, by contact with affected animals at fairs and exhibitions, by shipment in infected cars, and in community pastures.

Methods of eradication and prevention are described, and the advantages of the accredited-herd plan are pointed out.

The tuberculin test on cattle in Mauritius, F. E. LIONNET (*Dept. Agr. Mauritius, Gen. Ser., Bul. 16 (1919), [English Ed.], pp. 10*).—This bulletin describes the application of the tuberculin test in the examination of cattle in the colony of Mauritius since 1915.

The total number of animals inoculated up to the time of writing amounted to 639, of which 310 were milch cows and 329 bulls and cows in breeding herds. Of the former class, 8 only gave positive reactions and of the latter 32. The milch cows examined comprised about 10 per cent, and the animals from breeding herds 18 per cent of the total number in the respective herds.

The cow in health and disease, G. H. CONN (*Kansas City, Mo.: Burton Pub. Co., [1918], pp. 139*).—A popular account.

Meat poisoning and its relation to diseases of men and of animals, SPIECKER (*Hyg. Rundschau, 29 (1919), No. 4, pp. 113–124*).—This is essentially a review of the literature on meat poisoning. A bibliography of 150 titles is appended.

Meat poisoning epidemic in connection with a paratyphoid infection in sheep, H. FRICKINGER (*Ztschr. Fleisch u. Milchhyg., 29 (1919), No. 24, pp. 346–351*).—A meat poisoning epidemic with 1,500 cases and 4 deaths is described, which was definitely traced to the use of various forms of meat from sheep slaughtered after an illness at first diagnosed as salt poisoning but later proved to be a paratyphoid infection.

Contribution to the pathology of contagious abortion in sheep, R. MANNINGER (*Berlin. Tierärztl. Wchnschr., 34 (1918), No. 17, pp. 161–163*).—In 16 cases of abortion occurring in one flock of sheep there has been isolated from the fetuses, and from the blood, spleen, lymph, nodules, and serous discharges of the aborting sheep, an organism corresponding in every particular to the bipolar bacillus of hemorrhagic septicemia.

The specific prevention of paratyphoid abortion in mares, O. ZEH (*Berlin. Tierärztl. Wchnschr., 34 (1918), No. 2, pp. 11, 12*).—A method of immunizing mares against the paratyphoid bacillus found to be the cause of many abortions is described in which the antigen employed is prepared from a culture of the organism by autolysis, sterilization, and filtration, the resulting clear solution being preserved with 0.5 per cent phenol. Immunity is secured by a double vaccination with a 7- or 14-day interval between the two subcutaneous injections. The preparation has been put on the market in Germany under the name "parabortin."

As measures for combating paratyphoid infection in mares, the author recommends the prompt examination of aborted fetuses and blood samples for the organism, the greatest possible care in the disposal of the fetus and disinfection of the stall, double vaccination with parabortin of all aborting mares and of pregnant mares, both infected and noninfected, and the examination of all horses, stallions, and geldings as possible carriers of the bacillus in question.

RURAL ENGINEERING.

The rural efficiency guide.—II, Engineering, R. C. YEOMAN (*Cleveland, Ohio: The People's Efficiency Publishing Co., 1918, pp. VII+363, pl. 1, figs. 268*).—This is a compilation of data on agricultural and household engineering gathered from State, Federal, and private sources.

Agricultural hydraulics, F. DIÉNERT (*Hydrologie Agricole. Paris: J. B. Baillière & Sons, 1918, 2. ed., rev., pp. XII+458, figs. 177*).—This book is divided into six parts. Parts I and II deal with general and special hydrology. Part III deals with the quality of water, with special reference to its chemical and bacteriological analyses and its potability. Part IV deals with the sterilization and improvement of potable waters, taking up filtration and chemical processes, ultraviolet light treatment, and clarification processes. Part V deals with the use of water, taking up quantity required, pumping, storage, and distribution. Part VI deals strictly with water purification by chemical and biological processes. It constitutes one of the series Encyclopedie Agricole, published under the direction of G. Wery.

Handbook of hydraulics, H. W. KING (*New York: McGraw-Hill Book Co., Inc., 1918, pp. XVI+424, pl. 1, figs. 92*).—This handbook is a compilation of data for the solution of hydraulic problems. The older and commonly accepted hydraulic formulas are given preference except where, in the author's opinion, a gain in accuracy or simplicity will result from the adoption of newer formulas or methods.

The author departs from standard American practice in advocating the use of the Manning formula in place of the Kutter formula. New weir formulas are also submitted, which are shown to be simpler and to conform to existing experimental data more consistently than other formulas. Exponential formulas are advocated for pipes, but a simpler method of using them is given in detail.

Discharge coefficients for canal head gates, J. S. LONGWELL and J. HINDS (*Reclam. Rec.* [*U. S.*], *10* (*1919*), *No. 10, pp. 475–480, figs. 5*).—This article outlines a logical and practical method for the study of capacity, as related to existing head gates and the application of the results obtained to the design of future structures.

Water storage and the water code, G. E. P. SMITH (*Ariz. Col. Agr. Ext. Serv. Circ. 26* (*1918*), *pp. 7, pl. 1*).—This is a review of the water storage possibilities in Arizona for irrigation purposes, special attention being drawn to the possibilities on the Gila, Salt, Verde, and Colorado Rivers.

Relative viability of Bacillus coli and B. aerogenes types in water, C.-E. A. WINSLOW and B. COHEN (*Jour. Infect. Diseases, 23* (*1918*), *No. 1, pp. 82–89,* *figs. 2*).—Studies on the differentiation between two types of gas-forming organisms, *B. coli* and *B. ærogenes*, to obtain data to aid in sanitary water examinations for distinguishing between surface wash from areas of normal vegetation and from those which receive specific fecal pollution are reported.

It was found that when a mixture of gas-forming organisms of the *B. coli* and *B. ærogenes* types was stored in water all the gas-forming organisms present died off rather rapidly, so that in general from 98 to 99 per cent had disappeared by the tenth day. The *B. ærogenes* type decreased more rapidly than the *B. coli* type during the first 24 hours. After that period, however, the *B. coli* type died off more rapidly than the *B. ærogenes* type, so that while 54 per cent of all gas-forming organisms were of the *B. coli* type at the beginning of the experiments this percentage fell to 29 after 60 days.

"Studies previously reported indicate that a high proportion of the *B. ærogenes* type is not, as a matter of actual experience, common even in stored waters. In cases where a high proportion of this sort of gas former is actually found, however, it may apparently be due either to the fact that the gas formers present have come from grains rather than from fecal sources, or to a long period of storage which would tend to increase the relative frequency of the *B. ærogenes* as compared with the *B. coli* type."

The distribution of Bacillus coli and B. ærogenes types in polluted and unpolluted water, C.-E. A. WINSLOW and B. COHEN (*Jour. Infect. Diseases*, *22* (*1918*), *No. 1*, *pp. 90–101*).—Studies on the relative prevalence of *B. coli* and *B. ærogenes* types in waters of known sanitary quality, including polluted, nonpolluted and stored waters, are reported, which did not seem to show any connection between the type of organism and the corresponding source. It is generally concluded that the quantitative test for gas-forming aerobes of all sorts is a good guide to the sanitary quality of water. "If in a given sample a large proportion of the *B. ærogenes* types were actually found, the results might perhaps be interpreted as signifying that the gas-forming organisms present were presumably not of recent fecal origin."

Waste waters from potato-starch factories in Hungary; their noxious action and purification, J. HALMI (*Vízügyi Közlem.*, *6* (*1916*), *No. 1*, *pp. 1–22*; *abs. in Internatl. Inst. Agr.* [*Rome*], *Internatl. Rev. Sci. and Pract. Agr.*, *7* (*1916*), *No. 5*, *pp. 736–738*; *Ztschr. Angew. Chem.*, *31* (*1918*), *No. 42*, *Ref.*, *p. 163*).—This report briefly describes the manufacture of potato starch and the quantity, kind, composition, and noxious action of the waste waters, and reports processes for mechanical, chemical, and biological purification. Best results in purification were obtained in the experiments with a process based on (1) purification of the water in which the potatoes are washed by decantation, and (2) accumulation in special ditches of the noxious waste water obtained in the different manufacturing operations, and emptying after fermentation.

Determination of the duty of water by analytical experiment, W. C. HAMMATT (*Proc. Amer. Soc. Civ. Engin.*, *44* (*1918*), *No. 2*, *pp. 307–357*, *figs. 23*).—The purpose of this paper is to show the methods used in the determination of the quantity of water required for the growth of certain crops, where is was impracticable to measure it directly. This was done by analyses of the requirements and by the separate determination, by experiment, of the specific quantity required for the different parts which go to make up the whole use of water by the plant. Duty of water is considered as the quantity which can be applied with the greatest efficiency, under given conditions, for the production of crops.

It is concluded that by a study of the plant and its needs in regard to soil moisture, the method of application of the water may be determined; and by a study of soil and climatic conditions an analysis of the use of this water may be made which will vary in accuracy according to the extent of the investigation. It is not claimed by the author that this method is always superior to that of direct trial, but that it is useful in some cases where that is impracticable. In other cases it will give results which, taken in conjunction with the duty obtained by direct trial, will aid in the elimination of losses, the improvement in yield, and the betterment of irrigation methods.

The use of alkali water for irrigation, F. S. HARRIS and N. I. BUTT (*Utah Sta. Bul. 169* (*1919*), *pp. 3–41*, *figs. 17*).—The work of others bearing on the subject is discussed, and experiments are reported to determine the concentration of various salts necessary to make water unsuitable for irrigation in sand and loam soils.

It was found that the dry matter produced, the height of plants, the number and weight of leaves, the number and length of culms, the number of heads and spikelets, the turgidity of the plants, and the general appearance of the crops were all useful indicators of the effect of alkali water. Results in different soils showed that wheat should not be irrigated with water containing as much as 1,000 parts per million of sodium carbonate, and that even 500 parts per million will, in a short time, reduce the growth of the crop. More that 1,000 parts per million of sodium chlorid and more than 4,000 parts per million of sodium sulphate proved to be harmful after two or three years. A mixture of the three salts—sodium chlorid, sodium carbonate, and sodium sulphate—was not so harmful as the most toxic but was more toxic than the least toxic individual salt. More than 4,000 parts per million of the mixed salts proved to be dangerous. Dilute concentrations of the salts often stimulated plant growth. On land irrigated with alkali water for only one year, or with but a single irrigation, much stronger concentrations than mentioned above could be endured; but for regular irrigation water, any concentration above about 500 parts per million of sodium carbonate, 1,000 parts per million of sodium chlorid, 4,000 parts per million of sodium sulphate, and 4,000 parts per million of the mixed salts is considered dangerous.

Use and waste of irrigation water, G. E. P. SMITH (*Arizona Sta. Bul. 88* (*1919*), *pp. 207–224*, *pl. 1*, *figs. 9*).—This bulletin discusses transpiration by plants and water losses from canals and field laterals, by evaporation and seepage from irrigated fields, and by waste, and gives popular information on how to estimate the efficiency of irrigation.

Irrigation experiments on light and improved soils, M. GERLACH and G. GROPP (*Ztschr. Ver. Deut. Zuckerindus.*, *1917*, *No. 738*, *II*, *pp. 415–435*, *fig. 1*).—This is a review and a summary of several irrigation experiments with different crops on light sandy soils and on improved soils in Germany.

It was found that the irrigation of light sand soils in dry localities of Germany is profitable if a sufficient quantity of surface water is available near by. Further experiments showed that on improved soils crop yields were markedly increased by irrigation, especially on well fertilized soils. This was also the case with light sand soils. Greater net profits were obtained in the long run by irrigation of fertilized light sand soils.

Irrigation (*Almanach Soc. Sultan. Agr.*, *2* (*1918*), *pp. 131–151*, *figs. 2*).—This is a general summary of data on irrigation in Egypt from the Nile River, with special reference to irrigation methods and structures, quantities of water available and used, and general duty of water.

Irrigation, R. C. WOOD (*Dept. Agr. Madras Bul. 71* (*1917*), *pp.* [*11*]+*62*, *pls. 14*, *figs. 19*).—This bulletin gives general popular information on irrigation as it is practiced in Madras, special reference being made to the different mechanical contrivances in use by the natives for lifting water and to methods of applying and distributing water.

Tile drainage in South Carolina, F. G. Eason (*Columbia: S. C. Dept. Agr., 1918, pp. 61, figs. 21*).—It is of the purpose of this publication, prepared under the direction of Office of Public Roads and Rural Engineering of the U. S. Department of Agriculture, to discuss in detail the proper methods to be employed in establishing such systems of tile-drains on the wet lands of South Carolina as will effect reclamation, and to point out the resulting benefits.

It is stated that in the State there are about 3,200,000 acres of overflowed, wet, and swampy lands which are known as salt marsh, swamps, bays, flat cut-over lands, and bottoms. Data obtained from owners of 23,500 acres of land in the State indicate that "tile drained lands can be cultivated three weeks earlier than lands not so drained, and that they can be plowed after a rain 3 days sooner than undrained land. On lands that are tile drained, the crops are ready to harvest 8 days before the crops on undrained lands have matured. The summary also shows that the increased yield on tile-drained lands in years of heavy rainfall is 78 per cent, in years of average rainfall the increase is 45 per cent, and in years of light rainfall it is 29 per cent. Along with this should be noted that the increase in the value of the crops is $15 per acre and that the value of the lands practically doubled as a result of installing tile drains."

Data on engineering design and construction are included, together with a set of specifications for clay farm draintile.

Soil drainage, R. G. Allan (*Agr. Research Inst. Pusa, Bul. 85 (1918), pp. II+21, figs. 11*).—This bulletin describes field protection by embankments and surface drainage by ridge and furrow, and terracing methods, and describes the methods employed and results obtained in seven or eight years' underdrainage experience on loam and clay loam soils at the Agricultural College at Nagpur.

It was found that in general 2 ft. 6 in. represents about the minimum depth and 3 ft. 3 in. the maximum on any classes of soil drained, the lightest of which is free clay loam. The closest placing adopted was 18 ft. This was in a stiff clay soil. Though the drains appeared to work freely, even at this distance on the stiff soil the central area was only just influenced by the drain. On the black soil proper, a stiff clay loam, the drains were effective at 21 to 23 ft. apart with a depth of 2 ft. 8 in. (average). A number of areas on the farm were slighly less heavy than typical black soil, and in these 24 to 27 ft. was satisfactory with a depth of 2 ft. 10 in. The author is of the opinion that a grade for laterals of 1 in 200 is about the minimum permissible, and that a greater grade is advisable if available. The grades of mains used varied between 1 in 150 to 1 in 260.

Drainage and crop production in India, A. Howard and G. L. C. Howard (*Agr. Jour. India, 14 (1919), No. 3, pp. 377–387, pls. 3, figs. 3*).—This paper presents the results of different drainage experiments, the purpose being to show the relation of soil drainage to soil aeration and crop production.

It was found, on a heavy soil, that the effect of a month of water-logging was to reduce the yield of wheat by about 16 bu. per acre. With indigo, on a stiff soil, the effect of water-logging was to restrict plant development and root growth.

Lysimeter experiments with indigo, using alluvial soil in one set and light Pusa soil in another, are also reported. The alluvial soil was well supplied with available phosphate, while the light soil was not. It was found that in both soils the indigo in lysimeters with free drainage escaped wilt, but when the drainage openings were closed and water-logging took place below, the plants wilted in both soils. Wilting was worse in the alluvial soil than in the light soil and the growth was much slower. Stopping the drainage caused the lateral roots to run near the surface.

"Observations indicate that in many parts of India the surface drainage of large areas is defective and the crops suffer from poor soil aeration. In some cases this is due to the existence of extensive shallow, cup-shaped depressions which are unable to discharge the run-off quickly. In others, the general surface drainage is partially held up by roads, embankments, and by bridges provided with insufficient waterway. Such problems . . . need for their solution the services of the engineer.

Terracing in Oklahoma, M. R. Bentley (*Okla. Agr. Col., Ext. Div. Circ. 96 (1919), pp. 13, figs. 16*).—This circular deals with the Mangum terrace, as being the type considered the most practical for Oklahoma.

Forest clearing machines, Eberts (*Ztschr. Forst u. Jagdw., 51 (1919), No. 5, pp. 248–260, figs. 9*).—This is a description of machinery used in Germany for felling of timber and the grubbing of stumps.

Report of tests to demonstrate the adaptability of Grade-III TNT for clearing land, or similar uses, W. J. Montgomery (*Prof. Mem. Corps Engin. U. S. Army, 11 (1919), No. 57, pp. 260–262, fig. 1*).—Experiments on blasting oak stumps, splitting oak logs, and breaking boulders with Grade–III TNT are reported.

A solid oak stump about 3 ft. in diameter and standing 18 in. out of the ground on wet clay soil was successfully blasted with a charge of 7 lbs. of Grade–III TNT placed in 2-in. bore-holes 4 ft. below the surface, 1¾ lbs. to the hole. Two oak logs 6 ft. long and 39 and 42 in. in average diameter were successfully split into two pieces with 4 oz. and 5 oz. of Grade–III TNT, respectively, placed in a 2-in. bore-hole, midway between the ends.

It is concluded "that Grade–III TNT can be used for such purposes as shooting stumps, splitting logs, and breaking bowlders . . . It seems possible that the number of bore-holes under a stump of the type of Shot No. 1 might be reduced to three or, in some cases, even less. No. 8 electric detonators seem to insure complete detonation. It seems probable that a smaller auger than 2 in. might be used to bore the holes for splitting logs, thus saving time and labor. In adobe shots on large flat bowlders, better results might be secured by using the same weight of explosive but placing it in two or more charges symmetrically distributed."

Report on shot of Grade-III TNT under water, W. J. Montgomery (*Prof. Mem. Corps Engin. U. S. Army, 11 (1919), No. 57, pp. 263, 264*).—An experiment on blasting a stump with Grade–III TNT, in which the bore-hole was under water, led to the conclusion "that immersion of Grade–III TNT under 3½ ft. of water for 15 minutes does not prevent detonation. A No. 8 electric detonator seems to be sufficiently effective to insure detonation."

Report of tests to determine the adaptability of Grade-III TNT for shooting oak stumps, W. J. Montgomery (*Prof. Mem. Corps Engin. U. S. Army, 11 (1919), No. 57, pp. 270–276, figs. 10*).—Experiments on the efficiency of Grade–III TNT as a stumping powder led to the conclusions that oak stumps can be blasted with this material, but that 9 lbs. of TNT as used for a 3-ft. stump is too large a charge and that about 5 lbs. for a 3-ft. stump and 2 lbs. for a 1½-ft. stump are about correct. It is further concluded that exposure of the explosive for a short time, i. e., an hour to the moisture in a wet bore-hole, does not materially reduce its efficiency.

"Adobe" shot with Grade-III TNT on bowlder, J. E. Tiffany (*Prof. Mem. Corps Engin. U. S. Army, 11 (1919), No. 57, p. 259*).—An experiment with Grade–III TNT for breaking a sandstone bowlder 6 ft. long, 3 ft. wide, and 1½ ft. thick is reported. Two-thirds of the under surface of the bowlder was supported on the ground while the balance projected over a bank. A TNT cartridge 6 in. long by 1½ in. in diameter, weighing 1½ lbs., was used. The cartridge was laid centrally on the upper surface of the bowlder and loose TNT was piled over it. The charge was covered with paper and clay to a thickness of about 2½ in. A No. 8 electric detonator was used.

As a result of the explosion, the bowlder was shattered to a greater or less extent throughout its entire mass. The largest piece was broken from the projecting side of the bowlder and measured approximately 2 by 2 by 1 ft. The next largest piece was about 1½ ft. square and 6 in. thick. Probably 40 per cent of the bowlder was broken into fragments 2 in. and less.

"This one trial demonstrated the possibility of using Grade-III TNT for breaking up bowlders. For bowlders of a similar nature and size, less explosive should be used."

American highway engineers' handbook, A. H. Blanchard et al. (*New York: John Wiley & Sons, Inc., 1919, pp. XXIV+1658, figs. 455*).—This handbook includes "reliable and comprehensive information on all branches of highway engineering and related subjects which would prove useful to highway officials, engineers, chemists, contractors, and engineer-salesmen of highway materials and machinery."

Handbook for highway engineers, W. G. Harger and E. A. Bonney (*New York: McGraw-Hill Book Co., Inc., 1919, 3. ed., rev. and enl., pp. XXII+986, pls. 2, figs. 300*).—This handbook contains information ordinarily used in the design and construction of rural highways, covers principles of design and practice of design and construction, and gives specifications, general tables, and traffic rules and regulations.

A treatise on roads and pavements, I. O. Baker (*New York: John Wiley & Sons, Inc., 1918, 3. ed., rev. and enl., pp. XI+666, figs. 235*).—This is the third edition of this book, rewritten and enlarged (E. S. R., 31, p. 90). Five old chapters have been dropped and five new ones substituted therefor. Attention is given to materials and forms of construction that affect the quality and cost of the road and pavement rather than to the machines employed and the methods of doing the work. The book is divided into two parts. Part I, dealing with country roads, includes matters relating to earth, sand, and sand-clay, gravel, water-bound macadam, bituminous macadam, and concrete roads in rural districts. Part II deals with city pavements.

Fourth biennial report of the Wisconsin Highway Commission, 1916-17 (*Wis. Highway Comm. Bien. Rpt., 4 (1916-17), pp. 359, pl. 1, figs. 130*).—This is a report of the activities and expenditures of the Wisconsin Highway Commission, including State and highway operations, for the years 1916 and 1917, and includes preliminary estimates of operations in the calendar year 1918.

Experiments on covering sand roads with tar and marsh hay together and with marsh hay or rye straw covered with a thin layer of sand showed that the untreated hay was destroyed largely because it rotted, and not especially because it wore out. The untreated hay with sand on it enabled the treated layer to be placed much more uniformly and without the formation of ruts, but the first layer of hay was of no special lasting benefit to the road. The method of applying the tar was not satisfactory. The running of a heavy oiler over the layer of hay formed large ruts in the sand beneath, which could not be removed. Owing to the draft of traffic the hills became bunched somewhat easier than the flats. There was very little difference in the results with hay and straw. The mere adding of sand to an untreated application of hay or straw greatly increased its life, and it was felt that this discovery alone was worth the price of the entire experiment.

Experiments on surface treatment for macadam roads led to the conclusion that "a bituminous layer about 2 in. thick can be successfully placed on an old road with the cold penetration method, and this layer can be made wider than the old road, especially where there has been a certain amount of the original metal brushed off into the shoulders by the traffic. Where an old macadam road is fairly rough, but uniformly so, not being full of large holes, the larger the absorbents used and the more angular it is the better will be the surface carpet. In other words, the crushed quartzite and the ⅜-in. pea gravel gave better results than any of the other absorbents, especially on the rough quartzite road. A fine sand of poor quality is little better than no absorbent at all, except that it prevents the bitumen from being picked up by the passing vehicles. Where material is being shipped in for an absorbent, it is better to ship in material over ¼ in. rather than under, as some additional metal will then be placed on the highway.

"It was found that more care was required in the placing of resurfacing with asphalt than was required with the light tar by the cold penetration method. . . . It was also found that the tar penetrated a little better and a satisfactory job could be obtained under more adverse conditions than could be obtained with asphalt. . . . A more satisfactory surface treatment was obtained where a very light treatment of tar was used as the first application. This could then be successfully followed by more tar or by an asphalt treatment. It seemed that the tar penetrated much better and provided a better bond for later treatments.

"It was found that it did not pay to treat macadam roads that were in very poor and rough condition. . . . Better results were obtained by leaving the bitumen uncovered for some time before applying the absorbent, especially where sand was used as an absorbent."

Wood and other organic structural materials, C. H. SNOW (*New York: McGraw-Hill Book Co., Inc., 1917, pp. XVIII+478, pls. 20, figs. 90*).—The purpose of this book is to present general as well as physical characteristics of a group of structural materials most of which are of organic origin. Among these are woods, paints, and varnishes with their associated oils, pigments, gums, and resins, glues, creosotes, and india rubber. The book is intended for engineers, architects, students, and teachers.

"The opportunity is taken to criticize the degree of emphasis often laid in textbooks upon these properties of structural materials which relate to strength. That this phase of the subject should be given precedence is beyond all question, but that it should ever be emphasized so greatly as to diminish or more or less replace attention which might otherwise be given to other features, such as durability, is questioned. . . . The belief is expressed that many students in schools of technology do not realize as early as they should how real, live, and practical the subject 'Properties of Structural Materials' is, and how greatly knowledge of it will influence works which they may later design and construct, and that one cause for this, in the case of some students, is the slight or omission here referred to."

Timber: Its strength, seasoning, and grading, H. S. BETTS (*New York: McGraw-Hill Book Co., Inc., 1919, pp. X+284, pls. 2, figs. 112*).—This is a handbook of information intended primarily for engineers, manufacturers, and users of lumber and various special classes of wood material, and for students of engineering and forestry. The data given are derived almost entirely from tests and investigations on the mechanical properties of wood made by the Forest Service of the U. S. Department of Agriculture. The following chapters are included: Timber resources of the United States, the strength of wood, effect of moisture and of preservative and conditioning treatments on the strength of wood, strength of wooden products, the seasoning of wood, the grading of lumber by manufacturers' associations, and lumber produced and used in the United States.

Relation between average life of ties and percentage of renewals, M. E. THORNE (*Proc. Amer. Wood-Preservers' Assoc., 14 (1918), pp. 150–160, figs. 3*).—Data on 42,000 ties are reported showing that "up to 30 per cent of average life, in general, no ties are removed; that at the time of average life 60 per cent of the ties have been removed; and that at one and two-thirds times the average life practically all are out. . . . Although the average life of treated ties may be much greater than that of untreated ties of the same species, the results so far indicate that the renewals in proportion to the average life are the same in both cases." It is generally conceded "that of the treated ties the greater percentage of renewals is due to mechanical failure, and of untreated ties by far the greater part is due to decay."

Electrolysis in concrete, E. B. ROSA, B. MCCOLLUM, and O. S. PETERS (*U. S. Dept. Com., Bur. Standards Technol. Paper 18, 2. ed. (1919), pp. 142, pls. 9, figs. 23*).—This bulletin reports (1) laboratory investigations relating to the nature and cause of the phenomena produced by the passage of electric currents through concrete, (2) field investigations with a view to establishing the probable extent of the danger in practice and the circumstances under which trouble is most likely to occur, and (3) a study of the various possible means of mitigating trouble from this source.

It was found that the passage of current from an iron anode into normal wet concrete caused destruction of the test specimen by cracking the concrete. This effect was found to occur within a short time where the potential gradient was in excess of 60 volts per foot. The cracking of reinforced concrete due to electric current was found to be attributable to the oxidation of the iron anode following electrolytic corrosion. The mechanical pressure developed at the iron anode surface by corrosion of the iron was found to reach values as high as 4,700 lbs. per square inch. The use of aluminum or copperclad reinforcing was found to be impracticable.

Corrosion of iron anodes even in wet concrete was very slight at temperatures below about 45° C. (113° F.). For any fixed temperature the amount of corrosion for a given number of ampere hours was independent of the current strength.

"The addition of a small amount of salt (a fraction of 1 per cent) to concrete has a twofold effect, viz, it greatly increases the initial conductivity of the wet concrete, thus allowing more current to flow, and it also destroys the passive condition of the iron at ordinary temperatures, thus multiplying by many hundreds of times the rate of corrosion and consequent tendency of the concrete to crack. Salt should therefore never be used in structures that may be subjected to electrolytic action. Further, reinforced concrete structures built in contact with sea water or in salt marshes are more susceptible to electrolysis troubles than concrete not subjected to such influences."

There was a distinct softening of the concrete near the cathode, beginning at the cathode surface and slowly spreading outward, in some cases as much as ½ in. or more and causing practically complete destruction of the bond. Unlike the anode effect which became serious in normal concrete only on comparatively high voltages, the cathode effect developed at all voltages used in the experiments, the rate being roughly proportional to the voltage in a given specimen. This rate is not kept up indefinitely, however, because specimens kept in circuit eight years showed no more disintegration than those that had been in circuit only two or three years. In general the cathode effect occurs under conditions which may not infrequently occur in practice, and is therefore probably a more serious matter practically than the anode effect. "Because of the cathode effect noted, the proposal to protect reinforced concrete buildings by maintaining the reinforcing material cathode as by a battery or booster would be much more dangerous than no protection at all. . . .

"If reinforced concrete could be thoroughly waterproofed, it would greatly increase its resistance and diminish accordingly the danger from either the anode or cathode effects. . . . It has been found that practically all of the waterproofing agents now on the market that are intended to be mixed with the concrete are of little value as preventives of electrolysis. . . .

"In order to insure safety of reinforced concrete from electrolysis, the investigation shows that potential gradients must be kept much lower in structures exposed to the action of salt waters, pickling baths, and all solutions which tend to destroy the passive state of iron. All direct-current electric power circuits within concrete buildings should be kept free from grounds. . . . All pipe-lines entering concrete buildings should, if possible, be provided with insulating joints outside the building. . . . Lead-covered cables entering such buildings should be isolated from the concrete. . . . The interconnection of all metal work within a building is an advantage where practicable. . . . As a precautionary measure, all potential differences about a reinforced concrete structure should be kept as low as practicable."

The inclosing of pastures with wire, BRÜNE (*Mitt. Ver. Förd. Moorkult. Deut. Reiche, 37 (1919), Nos. 8, pp. 211–217; 9, pp. 230–237, figs. 9*).—The construction of wire fences for inclosing pastures according to German practice is described.

Farm engines and how to run them, J. H. STEPHENSON ET AL. (*Chicago: Frederick J. Drake & Co.,* [*1918*], *pp. 252+*[*III*], *figs. 78*).—This is a practical handbook describing each part of an engine and boiler, and giving directions for the safe and economical management of both. Other chapters are included on farm engine economy with special reference to traction and gasoline farm engines, and on water supply systems in the farm home.

Traction farming and traction engineering—gasoline, alcohol, kerosene, J. H. STEPHENSON (*Chicago: Frederick J. Drake & Co.,* [*1917*], *pp. 412, figs. 203*).—This is a practical handbook for the owners and operators of gas and oil engines on the farm, comprising a description of (1) what are considered the leading makes of farm tractors with directions for their care and operation, and (2) of engines for water supply and electric lighting on the farm. A special section is devoted to thrashing machines and the science of thrashing.

Starting the tractor engine at ten below zero, H. FARRINGTON (*Agrimotor, 2 (1919), No. 4, pp. 22–24, figs. 3*).—This article describes and illustrates a starter for tractor engines operated by air pressure and gives the results of special service tests.

The farm tractor handbook, G. SHERWOOD (*London: Iliffe & Sons, Ltd., pp. 168+*[*IV*], *figs. 121*).—This book gives popular information regarding the operation, maintenance, advantageous use, and proper selection of a tractor. It contains the following chapters: The internal combustion engine; carburation, lubrication, and cooling; ignition; transmission and steering; starting and repairs; horsepower and drawbar pull; different types of tractor; plows; plowing and belt work; steam tractors; and converting a touring car into a tractor. A list of tractor makers in the United Kingdom is added.

Light tractor experience survey (*Canad. Thresherman and Farmer, 24 (1919), No. 4, pp. 10, 12, 14, 16, 18, 18B*).—The results of a questionnaire sent to 213 gas tractor owners in Manitoba, Saskatchewan, and Alberta are reported in detail, giving data on kind and size of tractor, operation, soil types, and economy. Only 12 of the total number stated that the tractor was not a successful investment.

Influence of tractor weight on drawbar pull, H. Farrington (*Agrimotor, 2 (1918), No. 2, pp. 6–8*).—This is a discussion of experimental work conducted by C. M. Eason, in which a formula for drawbar pull of tractors was derived mathematically and by experiment as follows:

$$P=\frac{4.85\ B^2SCGE}{D}-f\ W$$

In this formula, P=drawbar pull in pounds, B=bore of engine in inches, S=stroke of engine in inches, C=number of cylinders in engine, G=total gear reduction between engine and drive wheel, E=efficiency of transmission system, D=radius of drive wheel in inches, f=factor depending on ground over which tractor is working (0.15 for sod; 0.2 for stubble; from 0.25 to 0.3 for soft, plowed ground), and W=weight of tractor in pounds.

Dynamometer for tractor and implement tests, H. S. McIntosh (*Agrimotor, 2 (1919), No. 4, pp. 17, 18, figs. 6*).—This article describes and illustrates a new dynamometer operating by hydraulic pressure.

Review of mechanical cultivation, M. Ringelmann (*Bul. Soc. Encour. Indus. Natl. [Paris], 118 (1919), I, No. 2, pp. 364–383, figs. 5*).—This is a summary of tests and demonstrations of tractor cultivation, and of important features of advancement in mechanical cultivating apparatus.

New agricultural implements for India, G. S. Henderson (*Agr. Research Inst. Pusa Bul. 73 (1918), pp. 6, pls. 9, figs. 5*).—Implements which have been introduced from time to time and used in Sind are here described and illustrated. They are mostly modifications of implements in common use in Egyptian agriculture, and include plows, scrapers, thrashers, screw water-lifts, and wheel water-lifts.

Balances and hitches for agricultural machines, M. Conti (*Univ. Nac. Buenos Aires, Rev. Facult. Agron. y Vet., 2 (1919), No. 2, pp. 128–132, figs. 4*).—Equalizers and hitches for different horse-drawn implements are described and illustrated.

[Plowing] experiment (*Agrimotor, 2 (1919), No. 4, p. 46*).—Plowing experiments on brown silt prairie loam soil to compare different kinds and depths of plowing in preparing land for corn on the subsequent yield of corn showed that plowing 6 in. deep gave the largest yield, both with the moldboard and the disk plows. Shallow plowing 4 in. deep with the moldboard plow yielded 3 bu. less per acre than the 6-in. plowing. The disk plowing 6 in. deep yielded 0.75 bu. more per acre than the moldboard plowing at the same depth. The lowest yields were from land plowed with the deep furrow plow.

Milking machines, W. Burkitt (*Trans. Highland and Agr. Soc. Scot., 5. ser., 29 (1917), pp. 229–250*).—This is a report on an investigation made in Scotland regarding the use of milking machines, and is based on 125 replies to a questionnaire sent to users of milking machines and on a tour of inspection of machines at work and idle. The different types of machines inspected are described.

From the replies received from users of milking machines, 113 were classed as satisfactory, 5 as doubtful, and 7 as unsatisfactory.

It is concluded that "there are several reliable milking machines now on the market, and their success or failure in everyday use depends entirely on the care bestowed on them and the interest taken in their working. . . . It is not so much a question of the machine but rather the man who works it."

It is the opinion from this investigation that the use of a minimum of rubber in manufacture is advisable owing to the fact that rubber is expensive, perishable, and difficult to clean. A stout lining to the cups is considered very desirable, as these wear out much more quickly than any other part of the machine. "A frequent source of trouble is the pulsator, which often, through overlubrication by unskilled hands, clogs up and stops; the fewer pulsators, therefore, the better. . . . The single-can type is the best, both for keeping of milk records and for general working, being more easily handled in every way, though some users are strongly in favor of the double-can type. The cow-borne receptacle has its advantages in being difficult to dislodge and permitting the use of celluloid milk tubes, but the shape of the receptacle is not very convenient for emptying, nor is the machine too easy of attachment, unless handled by an expert workman. While there seemed little to choose between the single-tube and double-tube machines when seen at work, as the metal cups with rubber mouthpieces only seemed quite successful, being durable and easily cleaned, the single-tube machine is now much less often used than the double-tube type."

Report of committee on labor-saving devices, R. R. HIND (*Proc. Hawaii. Sugar Planters' Assoc., 37 (1917), pp. 308–359, figs. 29*).—This is a report of the findings and conclusions of the committee with reference to labor-saving devices in the sugar industry, with special reference to can loaders.

Report of the committee on manufacturing machinery, J. N. S. WILLIAMS ET AL. (*Proc. Hawaii. Sugar Planters' Assoc., 37 (1917), pp. 259–308, figs. 8*).—This report contains the findings and conclusions of the committee regarding the following types of sugar machinery: Mills, carrier and conveying apparatus; boilers and steam generating plants; clarifiers, settling tanks, and filters, including molasses clarification; evaporating apparatus and vacuum pans; and crystallizers and centrifugal apparatus dealing with low-grade sugars. Machinery repairs are also reported on.

Cotton gin fires caused by static electricity (*U. S. Dept. Agr., Dept. Circ. 28 (1919), pp. 8, figs. 2*).—This circular states that the main cause of fires in cotton gins is static electricity, and gives information regarding prevention of fires from this source. It is recommended that the machinery be grounded by connecting all metal parts of the gin by No. 10 insulated copper wire.

"Run at least three heavier insulated wires (No. 14) to underground water pipes, or to rods driven 4 or 5 ft. or more into the ground. Starting from the suction pipe, make contacts to the telescope pipe, on the flange, just below the canvas joint, with one or two more contacts between it and the cleaner, depending on the length of the pipe. Run this wire on into the cleaner, making contacts to all the screens—two on the larger ones—as well as to all journal boxes on at least one side of the cleaner. Bring the wires from these contact points together. From here run a wire to all journal boxes on one side of each feeder and gin stand to the screens of the cleaner feeders, and to the lint flue, bringing wires from these points together. Contacts should also be made to the overflow, telescope, and suction pipe. Connect these wires with the ground wires at the following points: (1) Where the wires from the suction pipe meet, (2) where the cleaner connections come together, and (3) where the connections from the stands, feeders, and lint flue are brought together."

Grain dust explosions and fires, D. J. PRICE (*Safety Engin., 37 (1919), No. 6, pp. 296–300, fig. 1*).—This is a brief general review of the work of the Bureau of Chemistry of the U. S. Department of Agriculture on the prevention of grain dust explosions and fires, together with a statement of precautionary measures and dangers inherent in dust accumulation in grain elevators, flour mills, and the like.

Mechanics of the household, E. S. KEENE (*New York: McGraw-Hill Book Co., Inc., 1918, pp. X+391, figs. 285*).—This book deals with domestic machinery and household mechanical appliances, and is intended to be a presentation of the physical principles and mechanism employed therein. At least one representative piece of each type of household apparatus that is used in good practice is described. The subjects covered are as follows: The steam heating plant, the hot-water heating plant, the hot-air furnace, temperature regulation, management of heating plants, plumbing, water supply, sewage disposal, coal, atmospheric humidity, ventilation, gaseous and liquid fuels, and electricity.

Modern homes, barns, garages, and farm buildings (*Amer. Lumberman Bul. 36 (1919), pp. 24, figs. 62*).—This is a set of sample drawings.

Farm buildings (*Chicago: Breeders' Gaz., 1919, enl. ed., pp. 394, pls. 41, figs. 639*).—This is a compilation of plans representing actual construction by practical owners of general farm barns; cattle, dairy, and horse barns; sheep folds; swine pens; poultry houses; silos; feeding racks; farm gates; sheds; portable fences; etc. A section on concrete construction is included.

Dairy barn and milk house arrangement, J. H. FRANDSEN and W. B. NEVENS (*Nebraska Sta. Circ. 6 (1919), pp. 3–28, figs. 20*).—This gives considerable working data on the location, planning, construction, and equipment of dairy barns and milk houses, with special reference to Nebraska conditions. The ventilation of dairy barns is considered of special importance. The plan of removing foul air through out-take flues opening near the stable floor and admitting fresh air through flues opening at the ceiling has proved generally satisfactory. With reference to general arrangement of the stable, it is stated that cows should generally be arranged in two rows, lengthwise of the stable, requiring a barn 34 to 38 ft. in width. The width of individual stalls is usually taken at 3½ ft., although 4 ft. is used for cows of larger breed. Partitions between stalls are considered very desirable.

Barn ventilation, L. J. SMITH (*Manitoba Agr. Col. Bul. 33 (1918), pp. 23, figs. 19*).—This is a semipopular bulletin dealing with barn ventilation, with special reference to the King and Rutherford systems, and reporting service tests.

It is concluded that either system can be used in bank barns or in barns whose walls are made of stone, brick, or concrete. "If the walls are made of materials other than wood, the inside should be strapped with 1 by 2 in. strips, placed vertically about 2 ft. apart, and covered with shiplap of ceiling material to form a dead air space." Requirements for the successful operation of a ventilation system are stated as follows:

"The stable of the barn must be warmly built. The stable wall should have two thicknesses of boarding with building paper between, on the outside of the studding; and one thickness of boarding on the inside. The loft joists should be ceiled. Storm doors and storm windows conserve heat for better ventilation. Ceilings should not be too high, 7 to 7½ ft. for sheep, 7½ to 8 ft. for cattle, and 8 to 8½ ft. for horses. There is at least 10 per cent difference in the warmth of a stable with an 8-ft. ceiling and a like stable with an 8½-ft. ceiling, and the lower ceiling is cheaper."

It is stated that the cubic capacity should be less than 600 cu. ft. per animal for cattle and less than 750 cu. ft. per animal for horses. "Out-take flues must be well built with double boarding and with building paper between. In extremely cold weather, out-take flues should be either entirely closed or wide open. Locate controls for out-take flues so they can be readily seen. Louvers in cupolas cause 'back drafting,' or at least sluggish air movements in windy weather. Do not make intake flue openings larger than 4 by 12 in. Dampers or slides for intake flues should fit well."

Poultry houses and fixtures (*Quincy, Ill.: Rel. Poultry Jour. Pub. Co., 1919, 8. ed., pp. 110+[1], figs. 242*).—This is a compilation of popular information on the planning and construction of poultry houses and fixtures, and includes sample plans.

Silos, A. D. Wilson (*Univ. Minn. Agr. Ext. Div. Spec. Bul. 43 (1919), pp. 16, figs. 17*).—General information is given on the planning and construction of silos, with special reference to Minnesota conditions.

Silos and silage, C. A. Figueroa (*Rev. Agr. Puerto Rico, 2 (1919), No. 4, pp. 33–37, pl. 1*).—General information is given on silo planning and construction, with special reference to Porto Rican conditions.

The fodder silo, S. Rodriguez (*Min. Indus. [Uruguay], Insp. Nac. Ganadería y Agr. Bol. 35 (1919), pp. 22, figs. 10*).—This bulletin gives general information on the planning, construction, and filling of silos for corn and other fodder, with special reference to conditions in Argentina.

RURAL ECONOMICS.

Topical studies and references on the economic history of American agriculture, L. B. Schmidt (*Philadelphia: The McKinley Pub. Co., 1919, pp. 94*).—The outline and bibliography is presented in four parts: The beginnings of American agriculture, the westward movement of pioneer and planter into the Mississippi Valley, the Agrarian Revolution, and the opening of the far West, and the reorganization of the agricultural industry.

The farmer and the new day, K. L. Butterfield (*Hoard's Dairyman, 1919, Dec. 19, p. 1024, figs. 2*).—The four indications of the new day are the agitation of the farmer's equivalent of the minimum wage or a reasonable return for his labor depending upon a balance between the world's need for and supply of food products, fuller representation of farmers at council tables of the Nation, a farmers' group taking part in politics yet not a permanent farmers' party, and realization on the part of the farmer of the importance to him of adequate education, recreation, and health conditions.

Has New York an agricultural policy? W. H. Jordan (*N. Y. State Hort. Soc. Proc., 1 (1919), pp. 71–80*).—This is a discussion of the trend of agricultural policy in general away from the point of view of increased production and toward organization and representation in national affairs for farmers. Suggestions are offered regarding a comprehensive national agency which should express the agricultural policy of the United States.

Address of D. F. Houston, Secretary of Agriculture, before the Association of American Agricultural Colleges and Experiment Stations (*U. S. Dept. Agr., Off. Sec. Circ. 147 (1919), pp. 11*).—In this address, delivered at Chicago November 12, 1919, it is held that industrial unrest and uncertainty is crippling production, while the opening up of shipping and the beginning of the agricultural recovery of Europe is lessening the demand for agricultural products from this country. It is urged that every producing class must do its part to reestablish stable conditions, as otherwise the effect on farmers will be reduction of prices of farm products, while the manufactured articles they require will remain at a high price. The need for a broad rural survey and the calling of a conference of farmers, agricultual leaders, and business men is urged, and tribute is paid to the agricultural colleges in the exercise of their functions of investigation, technical education, and of safeguarding democracy as previously noted (E. S. R., 41, p. 605).

Address of D. F. Houston, Secretary of Agriculture, before the National Association of Commissioners of Agriculture (*U. S. Dept. Agr., Off. Sec. Circ. 146 (1919), pp. 12*).—This address, delivered at Chicago November 16, 1919, discusses the upward trend of acre yields at home and abroad in recent years, farm land problems, and methods of extending the farm area and aiding intending settlers, also marketing, cooperative associations, and the field which exists for the efforts of all agencies interested in the promotion of agriculture.

Mr. Lloyd George and agriculture (*Agr. Gaz. [London], 90 (1919), No. 2391, pp. 427–431, fig. 1*).—A verbatim report of the Prime Minister's speech before an audience of landowners, farmers, and laborers, October 21, 1919, is published here. The speaker emphatically declares the attitude of the British Government as in favor of guarantied prices on agricultural products, the amount and duration of which is to be declared by the Royal Commission on Agriculture, security of tenancy and rent to the farmer, and a minimum wage to the laborer. The latter is urged, however, not to make exorbitant demands. Matters of long and short term credit, development of transportation, scientific aid for technical education, and the improvement of village life and development of village industries are touched upon.

French agriculture and the war, H. Sagnier (*Trav. et Notices, Acad. Agr. France, vol. 1 (1918), pp. 493–520, figs. 5*).—A brief summary is given of harvests and prices of wheat and other cereals in France in recent years, and of the changes brought about by the war. The effects of the war upon the forests, numbers of live stock and prices of meat, and the labor supply for French agriculture are included in the discussion.

The foreign demand for agricultural products, B. H. Hibbard (*Hoard's Dairyman, 1919, Dec. 19, p. 1032, figs. 2*).—This analysis arrives at the conclusion that the foreign demand for our agricultural products will fall off as Europe turns to South America, Australia, South Africa, and Southern Asia for cheaper products, and that high prices, having arisen out of the short available supply of goods and an inflation of the money supply, will undergo change with the future competition for markets.

The vital concern of agriculture in foreign trade, C. J. Brand (*Ann. Amer. Acad. Polit. and Soc. Sci., 83 (1919), No. 172, pp. 35–47*).—Following an introduction on the importance of export trade, obstacles to export in the past, and reasonable prices and standard quality as requisites to success of export trade in the future, the specific activities of the Bureau of Markets of the U. S. Department of Agriculture in regard to export trade in grain and grain products, cotton and cottonseed products, live stock and meats, dairy and poultry products, fruits, vegetables, nuts, and honey, and tobacco, the export forwarding and transportation of agricultural products, and marine insurance, and assistance to producers and exporters in developing foreign markets are outlined. The organization and facilities for carrying on the work are set forth.

International phases of the land question, T. N. Carver (*Ann. Amer. Acad. Polit. and Soc. Sci., 83 (1919), No. 172, pp. 16–21*).—The author treats of currents of migration and the development of expanding or pent-up civilizations as depending upon land policy. The possibilities of further expansion in our own country are noted. Four things necessary to bring the areas under food crops are a population capable of consuming the crops and able to pay a remunerative price for them; means of transportation capable of carrying these crops to the population; a change in the standard of living which will make the people willing to eat more potatoes, both white and sweet, than at present; and a liberal land policy with respect to the reclamation and settlement of those lands.

Public lands in Oregon and Washington (*Portland, Oreg.: Oreg.-Wash. R. R. & Navigation Co., pp. 15, pl. 1*).—In answer to inquiries relating to the acquisition of public lands, this publication shows the approximate acreages of unsold State lands in various counties of Oregon and Washington and of unappropriated and unreserved Government lands by land districts and counties on July 1, 1912, with short descriptions of their character, as well as briefs of homestead laws, the timber and stone-land act, the desert-land act, and the Carey Act, and information concerning irrigation in Washington and Oregon by the National Government.

Farm tenancy, C. H. TAYLOR (*Bien. Rpt. Kans. Bd. Agr., 21 (1917–18), pp. 43–49*).—This sets forth as the three principal evils of farm tenancy in this country the depletion of soil fertility, the depressing effect on the citizenship of the tenant, and the waste of labor in the annual moving. Some instances of successful tenant arrangements are noted, and several legislative measures are recommended.

The agricultural laborer, J. VALDOUR (*L'Ouvrier Agricole. Paris: Arthur Rousseau, 1919, pp. 312*).—Accounts are given of the author's own experiences in hiring himself as a laborer in the hay harvest and grape gathering seasons in three different Provinces of France, viz, Brie, Beauce, and Languedoc.

The report is concerned with the rich peasant proprietor, the middle class farmer, the peasant farmer, and the farm labor-jobber, as well as the fixed and accidental personnel on the farms. The author discusses the salaries, methods of hiring, details of the life of the laborers, their language, political and religious ideas, and their ways of expressing themselves.

Working and living conditions of women in Bavarian agriculture, R. KEMPF (*Schr. Ständigen Ausschusses Förd. Arbeiterinnen-Interessen, No. 9 (1918), pp. VIII+146*).—This study is based upon data collected by a permanent committee on improvement of interests of women workers, aided by the Catholic Women's Union, the Alliance for Women's Interests, the Bavarian Teachers' Federation, and others, and some additional material gotten in 1914 in answer to a questionnaire, complete returns for which were interrupted by the outbreak of the war.

Tabulations are made of answers to such general questions as size of holdings, the proportion of hired labor employed, the relation between size of holding and the number of members of the family employed on it, home industries in competition with agriculture as employment for women, and others. Special account is taken of the parentage and childhood, the husbands' occupation, working hours, living conditions, kind of food consumed, and conditions of childbearing of women day laborers on farms; also of the parentage, childhood, age, wages, hours, living conditions, and character of the work of hired girls and the wives and daughters of peasant farmers.

It is indicated by the answers returned that the working and living conditions of these women were quite favorable. The author concludes her paper by urging the importance of an active, independent share in the operation of the business for the wives and daughters of the peasant farmers.

The industrial council as a means for increasing agricultural production, H. WARMBOLD (*In Festschrift zur Feier des 100jährigen Bestehens der Kgl. Württ. Landwirtschaftlichen Hochschule Hohenheim. Stuttgart: Eugen Ulmer, 1918, pp. 294–318; Fühling's Landw. Ztg., 68 (1919), No. 1–2, pp. 1–25*).—This paper deals with the need for and functions of a body of professional business advisors and agricultural specialists who would work for improved and increased agricultural production and the highest possible returns on the business of large estates, medium and small holdings, and for the peasant farmer of Germany. A detailed distinction is made between the demands that would be made upon advisors of these two classes, and the ways in which they would cooperate and be supported by the German Agricultural Society are discussed.

Organization of a county for extension work: The farm-bureau plan, L. R. SIMONS (*U. S. Dept. Agr., Dept. Circ. 30* (*1919*), *pp. 26, figs. 3*).—This outlines the purposes of the farm bureau, chief features of the organization plan and its details as regards membership, program of work, officers, executive and community committees, ways of organizing a county, developing a permanent county organization, expanding the principally agricultural program to include home demonstration and boys' and girls' club work, and the organization assistance available at the agricultural college. A suggestive constitution and by-laws is included.

Solving the farmer's marketing problem, J. L. GEDDES (*Hoard's Dairyman, 1919, Dec. 19, pp. 1031, 1040, 1041, figs. 4*).—The advantages of rural motor truck routes in marketing farm products are set forth. Several routes in successful operation at the present time are noted.

Marketing opportunities for New Hampshire farmers, J. C. FARMER (*Concord: State Dept. Agr., 1918, pp. 32, pls. 4, fig. 1; also in N. H. Agr., 35* (*1917–18*), *pp. 32, pls. 4, fig. 1*).—In these pages some of the opportunities for marketing properly graded and packed dairy products, vegetables, fruit, and poultry products in cities and summer hotels are set forth. Potato grades, grades of hay and straw, and the practical application of the New Hampshire apple grading and packing law are outlined.

Eastern States exposition market plan, H. M. SELBY (*N. H. Agr., 35* (*1917–18*), *pp. 57–68*).—The organization, aims, and methods of working of the Eastern States Farmers' Exchange for meeting farmers' marketing and buying needs are described.

Marketing bureaus and cooperative laws, C. W. THOMPSON (*Missouri Bd. Agr. Mo. Bul., 17* (*1919*), *No. 8, pp. 8–16*).—A summary is given here of an address in which provisions of a suggestive draft of a law establishing a State division or bureau of markets were set forth and discussed.

Cooperation [in Ontario] (*Ontario Dept. Agr., Ann. Rpt. Agr. and Expt. Union, 40* (*1918*), *pp. 38–48*).—In these pages are published papers by F. C. Hart, R. W. E. Burnaby, R. W. Wade, and H. H. Le Drew, relating, respectively, instances of cooperative marketing associations throughout the Province; the organization and work of the United Farmers' Cooperative company; grades, number of pounds sold, and prices received for wool at the sale of the Ontario Sheep Breeders' Association; and the work of the Ontario Agricultural College in teaching principles of cooperation.

Has the foods and markets department of the Farms and Markets Council been of any use to a fruit grower or farmer in the sale of his produce? E. H. PORTER (*N. Y. State Hort. Soc. Proc., 1* (*1919*), *pp. 93–106, pl. 1*).—Some of the projects of the foods and markets department of the Farms and Markets Council and their relation to organization by fruit growers and to grading of fruit are outlined.

The middleman a necessity, L. D. H. WELD (*Bien. Rpt. Kans. Bd. Agr., 21* (*1917–18*), *pp. 58–67, figs. 4*).—The case of the middleman is presented here from the standpoint of his functions in distribution, procuring a market for and transporting and storing surplus production, developing new producing areas, etc.

"Hedging" in the futures market, R. E. Smith (*Chicago: [Author], 1919, 2. ed., pp. 16*).—The three classes of traders whose operations make futures markets are described, and it is asserted that futures markets, as a result of hedging, prevent monopoly of the cash grain business and reduce the cost of handling wheat from the farmer to the miller or the manufacturer as compared with the cost of other commodities.

Relation of banking to the cattle industry, M. L. McClure (*Bien. Rpt. Kans. Bd. Agr., 21 (1917–18), pp. 68–76, figs. 3*).—In this it is shown how financial support is important to cattle and other live stock interests. The services rendered during the war crisis by the Federal Reserve Bank and the loans made on stock cattle by the War Finance Corporation are noted. The author recommends 3- to 5-year loans secured by breeding herds of cattle.

Cost of production in relation to profits, A. Boss (*Bien. Rpt. Kans. Bd. Agr., 21 (1917–18), pp. 49–57, figs. 3*).—Increasing crop yields, securing extra prices, and reducing the cost of production are discussed briefly as ways of increasing profits from farming. Data from bulletins previously noted (E. S. R., 35, p. 691; 41, p. 91) are used in showing the labor cost of production of field crops and live stock.

Farm costing, A. D. Park (*New Zeal. Jour. Agr., 19 (1919), No. 3, pp. 148–151*).—In this article the main points in favor of a proper costing system are noted, emphasizing special requirements of farmers in the way of cost of production and profit and loss accounts. Some debit and credit items for crop, sheep, pig, and milk-production accounts are outlined.

Report of the farm survey in Oxford County, A. Leitch (*Ontario Dept. Agr., Ann. Rpt. Agr. and Expt. Union, 40 (1918), pp. 66–69*).—The conclusions appearing in this report of the survey, conducted during 1918, relate to factors influencing the labor incomes from dairy farms.

It was found that very small farms can not be as successfully organized as the larger farms. Increasing the crop area from 52 acres, as in the case of farms with under 70 acres tillable area, to 67 acres, as in the case of those with a tillable area of 91 to 100 acres, increased the labor income from $666 to $1,408, so that if the cost of clearing or draining the land was not above $100 per acre it would be a good proposition to clear up this uncultivated land.

The largest profits were obtained by those farmers who derived from 61 to 70 per cent of their total income from dairy products and the balance from the sale of hogs, poultry, horses, or sheep. On the farms where all-year dairying was practiced, labor was utilized more economically and the returns were nearly 20 per cent more. On 302 farms studied in four groups, in the fourth group where a pure-breed sire had been used over 10 years the profit was $57 per cow, or three times the profit from cows in the first group of farms using a grade sire. It was found that the cost of production on all farms whose main business was dairying was $2.17 per 100 lbs. of milk, and $2.20 on all farms in Oxford County, with the average selling price at $2.19½ per cwt. The price received for milk during the year was just sufficient to pay the average dairyman's farm expenses, 7 per cent interest on his investment, and $500 for his labor.

Methods of maintaining fertility on successful New Jersey farms, F. App (*Jour. Farm Econ., 1 (1919), No. 3, pp. 124–136*).—Dairy, potato, truck, and general farms in New Jersey are the agricultural types included in this study. In each case the crops grown, farm practice, fertilizers, and live stock are briefly discussed. Tables given show the amount of plant food bought in feed and fertilizers and sold in milk on 460 dairy farms of Sussex County, N. J.; plant food removed by crops and obtained through purchased fertilizers and manures on 40 successful potato farms of New Jersey; relation of live stock to yield and fertilizers; cost in 1914–15; relation of live stock to crop yields and fertilizers purchased on 280 general farms in Monmouth County, N. J., in 1914-15; and relation of manure to crop yields and profits and of fertilizers and green manure crops to crop yields and labor income on 300 New Jersey truck farms.

In conclusion, it is said that it is quite possible to maintain fertility and produce crops profitably on the general and potato farms through the use of commercial fertilizer and green manure. Live stock does not appear to be essential in a region where green manure and especially leguminous green manure crops can be successfully grown. The function of live stock in maining fertility probably will differ with the soil type or the locality. Methods of maintenance of fertility will differ with the climatic condition, the soil type, and the type of farming followed. The purchase of stable manure is too costly to allow the best profits when it can be replaced by the green manure and cover crops, which are the key to the most successful potato and truck as well as some general farms in New Jersey. Commercial fertilizers are needed to supplement both stable manure and green manure crops. Many farmers use too little fertilizers to obtain the greatest profits in their farming operations.

Texas Farm Management Association and the Texas Experiment Association (*Bul. Agr. and Mech. Col. Tex., 3. ser., 4 (1918), No. 21, pp. 145-168*).—At the joint sessions of these two organizations the following addresses were given: Grass as a Farm Crop in Texas, by W. A. Bowen; Cooperative Marketing of Live Stock, by W. F. Craddock; The Marketing of Seeds, Feeds, and Fertilizers in Car Lots, by O. W. Sherrill; Organizing for Cooperative Crop and Live Stock Improvement, by J. A. Moore; Organizing for Educational and Community Improvement, by C. L. Beason; The Organization and Operation of the National Farm Loan Association, by S. A. Lindsey; The Torrens System of Registration of Title to Land, by S. H. German; Texas Homestead Law, by T. Finty, Jr.; and A Modification of the Homestead Clause, by C. Ousley.

Manual of laws pertaining to the Department of Farms and Markets (*N. Y. State Dept. Farms and Markets, Agr. Bul., No. 120 (1919), pp. 301*).—This volume continues information previously noted (E. S. R., 40, p. 390).

Rural income-tax, A. D. PARK (*New Zeal. Jour. Agr., 18 (1919), No. 5, pp. 288-293*).—Some technicalities of returns of income, exemptions allowable, and rates chargeable are briefly analyzed, and a specimen return for dairy farmers of New Zealand, showing details of entering items of income and claims for special exemptions, is given.

Agriculture and forestry in Austria-Hungary, 1916 (*Österr. Statis. Handb., 35 (1916-17), pp. 54-79*).—Statistics of the area of land in agricultural use and in forests, of crop areas and returns, and of live stock and bees are given.

Prices and wages in India (*Dept. Statis. India, Prices and Wages India, 34 (1919), pp. X+278, pls. 3*).—Statistics up to the year 1917, and in some cases up to 1918, are included here on the plan of the issue previously noted (E. S. R., 37, p. 792).

AGRICULTURAL EDUCATION.

Relation of general science to agricultural instruction, K. L. HATCH, W. G. HUMMEL, and F. E. HEALD (*Gen. Sci. Quart., 4 (1919), No. 1, pp. 263-267*).—This is the report of a committee of the American Association for the Advancement of Agricultural Teaching, submitted at the meeting in Baltimore, Md., on January 1, 1919. It is based upon a study of the work in general science in several hundred selected high schools in all parts of the United States.

The percentages used in the report are based upon complete data secured in a special study of 58 schools by the chairman of the committee.

It was found that 93 per cent of the schools studied offer general science in the ninth grade, and all but 7 per cent of this group confine this study to this grade. One-half of the remaining 7 per cent offer work in this subject both in the seventh and eighth grades, the other half in both the ninth and tenth grades. Thirty-four per cent of the schools devote one semester to the subject, 58 per cent one year, 7 per cent two years, and 1 school spreads the work over three years. In 50 per cent of the schools the work is required of all students, and in an additional 28 per cent it is required of all groups taking scientific courses, and in but 22 per cent is it a wholly free elective. In 15 per cent of the schools the teaching is done by graduates of agricultural colleges, in 65 per cent by teachers who have specialized in some science in their college course, and in the remainder by persons of no special scientific preparation.

It is concluded that general science has become pretty firmly established as a ninth grade subject, and is pursued by the largest majority of the student body in schools offering instruction in the subject. Experience indicates a tendency toward daily recitations in this subject throughout a period of one year. The chief weaknesses are found in the preparation of the teachers and the character of the subject matter now presented in these courses.

In the opinion of the committee, teachers of agriculture should be thoroughly familiar with the plans and purposes of general science teaching, and the converse also is true. The agricultural colleges are considered best qualified for this work, as they base their courses upon a broad scientific training in all the differentiated sciences. The normal schools lack both in intensity and breadth of scientific work and in material equipment. The teachers' colleges and training departments train for instruction in the differentiated sciences with the weight of emphasis on professional work. University courses are frequently narrow and intensive, and no adequate machinery exists in most of these institutions for correlation of the various sciences.

Training teachers of agriculture, G. A. Bricker (*Ed. Rev., 58 (1919), No. 4, pp. 328–339*).—The author describes the various shortcomings, as teachers of agriculture, of teachers of nature study in the grades, agricultural college graduates, science teachers in high schools, and practical farmers.

He concludes that there must be specific training for teachers of agriculture, and that there is a difference between farmer training and teacher training which must be recognized and provided for. Further, that there must be departments in the agricultural colleges, teachers' colleges, and normal schools in charge of specialists of agricultural teaching. These departments should avail themselves of all courses possible for them to use in the training of the various grades of agricultural teachers and supervisors of agricultural teaching, and they should institute and offer new or special courses needed. A program of studies is briefly outlined. Four factors which, in the author's opinion, must be recognized in the formulation of a curriculum in agricultural education are discussed, viz, the technical training, including its application; the professional or pedagogical instruction, including supervised teaching experience under normal conditions; the general training (liberal arts) courses that are more or less contributory to the efficiency of the agricultural teacher; and the administrative, including organization and economic factors.

Survey of the needs in the field of vocational home economics education, Z. E. Bigelow (*Fed. Bd. Vocat. Ed. Bul. 37 (1919), pp. 26*).—This bulletin contains an analysis of the vocation of homemaking, and a discussion of its importance as indicated by the numbers reached by the vocation and the numbers engaged in it and in allied trades, the need for training in this vocation, the vocational advantages in this field offered by the home and the public school, groups to be reached by homemaking training, and ways of meeting the needs in the field of vocational home economics education.

The author concludes that if the girls and women in this country are to be given an opportunity to secure the training which is needed for the intelligent rearing of their families and for the welfare of their homes, the States and the Federal Government must cooperate fully for the promotion of home economics education. Among the special needs to which attention is called are the following: (1) Short unit courses for the older groups of girls and women, i. e., homemakers, domestic assistants, housekeepers who are also wage earners, and wage earners who are about to marry; (2) part-time schools or classes for the younger groups of girls who are not in school—girls who leave school and find employment in factories, stores, and homes, either because of financial stress or because of lack of interest in what the school offers, and of girls who have had to assume household duties in their own homes through some misfortune in their families; (3) all-day classes adapted to the vocational needs of girls in the school; (4) more variation in the content of the home economics courses; (5) courses in related arts and sciences; (6) courses of varying lengths and intensiveness to meet the diversity of conditions under which homemakers carry on their occupation; (7) more time for home economics courses in the public schools; (8) more varied equipment and its better adaptation to the aim of the course; (9) home project work; (10) methods of instruction which conform to the aim of teaching and which provide complete cooperation between the home and the school; (11) more well-trained teachers; (12) supervision; (13) leadership; (14) special studies in the field of home economics, such as the preparation that is best fitted to train teachers, the use of the home project in the homemaking course, community surveys, the preparation of short unit courses for the training of homemakers, methods of presentation of home economics subject matter, the kind of related sciences and art which should be taught in home economics courses, equipment for teaching homemaking, the value of the 12 months' home economics teacher, and the preparation and the development of correspondence courses; and (15) adequate funds.

Home economics in the woman's college, R. Wheeler (*Jour. Home Econ., 11 (1919), No. 9, pp. 375–380*).—The author distinguishes three main types of courses in home economics, viz, the technical, the university, and the academic courses. Of these, the academic course is found to be most backward. Goucher College, among the old academic colleges, has shown itself a pioneer in deciding to introduce home economics as an integral part of its curriculum. Its department of home economics will base its course on the physical and biological sciences and on economics, and will apply the facts and the methods of those sciences to the problems of housing, of clothing, and of nutrition. Just enough practical work will be given to vitalize and drive home the appplication and serve as a basis for individual study of such problems.

In the author's opinion "the courses in the woman's college will differ from that in the university as the latter differs from the courses in the technical school, in that a smaller proportion of time will be given to the getting of technique and a greater to work in related and marginal subjects. It will aim first to enrich the course of the general student and only secondarily to serve those students who major in home economics. A survey course will be offered without prerequisites which will give the foundations of home economics through lectures, reference work, and discussions; emphasizing the fact that the object of all home economics is to further the welfare of the family, whether it attacks problems of international and municipal housekeeping, or those of the individual or of the family group." Without majoring in home economics, any girl who has the necessary prerequisite of a year of college chemistry may take the first year of food study; one who has the foundation in chemistry and economics may take the work in textiles and clothing. The courses on the house also may be isolated.

Agricultural home economics instruction for women, E. R. ECHAVARRIA (*An. Soc. Rural Argentina, 53 (1919), No. 14, pp. 621–632, figs. 7*).—Attention is called to the necessity for home economics instruction in Argentina, and an account is given of the development of such instruction in the Republic, consisting of the instruction given in the Ramon Santamarina School of Agricultural Home Economics at Tandil, established in May, 1915, but suspended in 1918, and temporary courses of from one to two months' duration in various parts of the country. A brief statement of the facilities for home economics instruction in other countries is included.

The activity of the Experimental Institute of Agricultural Mechanics of the Faculty of Agronomy and Veterinary of Buenos Aires, M. CONTI (*Univ. Nac. Buenos Aires, Rev. Facult. Agron. y Vet., 2 (1919), No. 2, pp. 115–127, figs. 8*).—The courses in farm mechanics at the institution are briefly described. A bibliography is appended.

The ideal university, F. P. MAROTTA (*Univ. Nac. Buenos Aires, Rev. Facult. Agron. y Vet., 2 (1919), No. 1, pp. 51–67*).—This is a discussion in favor of the establishment of faculties of agronomy and veterinary science in connection with universities, and urging that such faculties remain in the University of Buenos Aires.

Agricultural education in the Republic of Argentina (*An. Soc. Rural Argentina, 53 (1919), No. 8, pp. 337–364, figs. 32*).—This is a review of the history and present status of agricultural education and research in Argentina.

Report of the commissioner of industrial and vocational education for the biennial period ending June 30, 1918, E. R. SNYDER (*[Bien.] Rpt. Commr. Indus. and Vocat. Ed. Cal., 1918, pp. 78*).—Special training classes for vocational teachers of agriculture are being maintained at the Davis Farm. The normal length of the course for graduates from the agricultural departments of land-grant colleges or universities who have had farm experience, and for certain selected students with senior standing in the agricultural departments of such institutions who have also had farm experience, is one year. All other persons are placed in courses the length of which is determined by the director and teacher of the class. Twelve university units of education or an equivalent are prescribed for all students. A third of these must be secured by practice teaching in farm project work and by a study of special methods appertaining thereto.

The Chico, Fresno, Los Angeles, San Diego, San Jose, and Santa Barbara State Normal Schools are cooperating with the State board in the training of teachers of vocational home economics. Of the 285 day high schools in the State, 222 give instruction in household science, 238 in household art, 101 in agricultural subjects, and 67 in agricultural club work. The development of part time instruction in home economics is considered surprisingly great, considering the length of time that classes have been maintained in this State.

Vocational education, F. G. BLAIR ET AL. (*Bd. Vocat. Ed. Ill., Rpt. Exec. Off. 1918, pp. 16*).—This report includes a history of the development of vocational education in Illinois and a report on the vocational education work from February to December, 1918. Reimbursement was made to 15 departments of vocational agriculture, mostly in township high schools in rural communities having already in operation good courses in agriculture, and to 7 full-time or high school classes in home economics, and 8 evening classes in home economics

First biennial report of the State Board for Vocational Education to the Thirty-eighth General Assembly (*Bien. Rpt. State Bd. Vocat. Ed. [Iowa], 1 (1917–18), pp. 11*).—The statistical data in this report indicate that 6 high schools received Federal and State aid for instruction in vocational agriculture in 1917–18. On January 1, 1919, 11 had such classes in operation, and 2 schools had classes in vocational home economics.

Agricultural education (*Bien. Rpt. State Supt. Pub. Instr. Kans., 21 (1917–18), pp. 69–72*).—This is the report of the director of agricultural education under the Smith-Hughes Act for 1917–18. Six schools were approved for Federal and State aid for vocational agriculture and began work on April 1, 1918, with a total enrollment of 82 students. The most serious problem facing the work in vocational agriculture was to secure qualified teachers. Because the work was organized so late in the school year, no departments of home economics were organized in city schools.

Annual report of the State Board for Vocational Education for the year ending June 30, 1919 (*Ann. Rpt. State Bd. Vocat. Ed. [Mich.], 1919, pp. 18*).—Under plans adopted for 1917–18, 49 schools were approved for Federal and State aid for 1918–19, with an enrollment in agricultural classes of 1,199 and in day and evening classes in home economics of 1,589. During the year 71 students were trained for teachers of vocational home economics, and 35 for teachers of vocational agriculture. Statistical tables are included.

The Michigan plan for vocational education under the Smith-Hughes law (*State Bd. Control Vocat. Ed. [Mich.], Vocat. Ed. Bul. 201, 2. ed. (1919), pp. 61*).—This is an outline of the Michigan State plan for vocational education for 1919–20. It is planned to devote approximately 40 per cent of the total teacher-training fund for teacher training in agricultural subjects and 20 per cent in home economics subjects. The Michigan Agricultural College has been designated for teacher training in agriculture and home economics and the Michigan State Normal College for home economics. The teacher-training course in agriculture is 4 years in length and consists of 240 credit hours, of which at least 20 must be in education. Observation and practice teaching in agriculture and home economics for teachers in training at the agricultural college is provided for in the East Lansing high school, the minimum amount of time for practice teaching in agriculture being 6 weeks for each student, and in home economics 2 hours daily 4 days of each week for 3 weeks. The teacher-training courses in home economics extend through 4 years. Four-year type courses in secondary vocational agriculture and home economics are outlined.

Plans for the administration of the Smith-Hughes Act in the State of Missouri for the school year 1919–20 (*Missouri State Bd. Ed., Vocat. Ed. Bul. 5 (1919–20), pp. 80*).—The State plans for vocational education in Missouri for 1919–20 are outlined. Only 2 years' work in vocational agriculture will be offered, and it is strongly recommended that it be given in the first and second years. The first year's work will be a general basic course, including animal husbandry, farm crops, soils, horticulture, and farm mechanics. The second year's work will include an intensive study of any two of the following: Farm crops, soils, animal husbandry, and horticulture.

The University of Missouri has been designated for teacher training in vocational agriculture and home economics. The course in agriculture extends over 4 years, or 120 semester hours, including 48 in agriculture, 24 in related subjects, and 18 in education. The course in home economics also covers 4 years or 120 semester hours. Four-year teacher-training courses in vocational agriculture and home economics and suggested courses in vocational home economics are outlined. Lists of minimum equipment, with prices, for vocational agriculture, farm mechanics, and home economics; lists of reference books for the first year's work in agriculture and home economics; and the text of the State vocational laws are included.

Annual report on vocational education and manual training for the year ending June 30, 1918, W. A. O'Leary (*N. J. Dept. Pub. Instr., Ann. Rpt. Vocat. Ed. and Manual Training, 1918, pp. 81, pls. 2*).—This report contains a brief review of the purpose of the Federal act for vocational education and an account of the way in which the Federal funds for 1917–18 were expended in New Jersey; also an outline of the plan for the expenditure of such funds for 1918–19 and a report on the work of the United States Boys' Working Reserve and the home gardens division of the Junior Industrial Army.

The State supervisor of agriculture devoted one-half of his time to the supervision of agriculture and the remaining half to the training of teachers of agriculture. Four high schools organized agricultural departments, and 2 counties, Atlantic and Cape May, maintained vocational schools of agriculture. During the year 120 persons received instruction in courses for training vocational teachers. Of these 82 were enrolled in the course for agricultural teachers, and 37 in the extension course for teachers of home economics.

The State college of agriculture has been designated for teacher training in agriculture and offers a 4-year course, an outline of which is given. The professional improvement of vocational teachers of agriculture in service is conducted by a series of monthly lectures and conferences at the State agricultural college under the direction of the State supervisor of agricultural schools. The plan for the professional improvement of agricultural teachers also requires each teacher to spend one month every year in certain additional work to be approved by the commissioner of education. A 4-year teacher-training course in home economics has been organized in the Women's College at Rutgers College.

Statistical tables are included.

State-aided evening vocational schools (*Univ. State N. Y. Bul. 688 (1919), pp. 37*).—This bulletin defines the kinds of evening vocational schools of agriculture, home economics, and the trades and industries entitled to special State aid under the education law relative to vocational instruction in the State of New York, effective August 1, 1919, and includes the text of this law, considerable material which is the outgrowth of State conferences of vocational directors and teachers and of conferences of the National Society for Vocational Education, and the results of investigations and studies made by the Federal Board for Vocational Education.

For the present it is provided that no Federal funds are to be distributed for evening classes entitled to aid under the State act. The State schools of agriculture at St. Lawrence University, at Alfred University, and at Morrisville may offer courses for the training of teachers in agriculture, mechanic arts, and domestic science or homemaking approved by the commissioner of education for State aid. Graduates from such approved courses may receive licenses to teach agriculture, mechanic arts, and homemaking in the public schools of the State.

Plans of the Oklahoma State Board of Vocational Education (*Okla. State Bd. Vocat. Ed. Bul. 3 (1919–20), pp. 35*).—This bulletin presents the plans for vocational education in Oklahoma for 1919–20.

It is proposed to devote 40 per cent of the total teacher-training funds for training teachers of agriculture and home economics, respectively. Resident teacher-training work in agriculture is provided for at the Oklahoma Agricultural and Mechanical College. The course extends over 4 years and consists of 120 college semester hours. At least 40 hours of technical agriculture will be required of a graduate of a standard college not specializing in agriculture. Arrangements have been made for teachers in training to be given practice teaching and observation and methods work in the secondary school of agriculture of the college and in the high school departments offering vocational agriculture. Resident teacher-training work in home economics will be given by the Oklahoma Agricultural and Mechanical College, the University of Oklahoma, and the Oklahoma College for Women. Itinerant teacher training and improvement of teachers in service is a function of the State supervisors of agricultural and home economics education, and in cooperation with the teacher-training institutions definite improvement work will be required by the supervisor for each county in the field.

Suggested 4-year courses in vocational agriculture and home economics are outlined.

Revised plans for organization and administration under the Smith-Hughes law [in Oregon] (*Oreg. Bd. Vocat. Ed. Bul. 2* (*1919*), *pp. 31*).—This is a statement of the plans for vocational education in Oregon for 1919–20.

Of the total funds available for teacher training, it is proposed to use 30 per cent for training in agricultural subjects and 45 per cent in home economics subjects. The teacher-training course in agriculture at the Oregon Agricultural College extends through four years, and includes 50 per cent of technical agricultural subjects, 10 per cent educational subjects, 20 per cent related and allied subjects, and the remainder of such required and elective subjects as will make a well-rounded curriculum. Observation and practice teaching has been provided for in the agricultural department of the Corvallis high school, an instructor in agricultural education from the college serving as critic teacher. The teacher-training course in home economics is four years in length and consists of home economics subjects 35 per cent, related subjects 21 per cent, professional courses in education 11 per cent, and general subjects 33 per cent.

Outlines of a one-year course in vocational agriculture and a two-year course in vocational home economics, and a tentative budget are included.

Annual report of the agricultural division to the State superintendent of public instruction for school year 1917–18, L. H. Dennis (*Rpt. Supt. Pub. Instr. Penn., 1918, pp. 19–36*).—This report states that during the year ended July 1, 1918, there were in operation in Pennsylvania 23 rural community vocational schools, each operating complete agricultural, homemaking, and academic departments; also 19 vocational departments of agriculture and 10 vocational departments of homemaking in other high schools. All but 4 of the vocational departments met the requirements for Federal aid in agricultural and home economics education. The total number of acres under cultivation by the vocational pupils of agriculture was 550, and 6,344 animals were cared for. The total approximate value of products was $85,695.

Eight of the rural community vocational schools conducted night schools for farmers with 47 meetings and a total enrollment of 389. Night schools in homemaking were also held by several of the supervisors of homemaking.

Plans for the cooperation of the State Board of Education with the Federal Board for Vocational Education for vocational education in South Dakota, 1919–20 and 1920–21 (*Pierre, S. Dak.: State Bd. Vocat. Ed.* [*1919*], *pp. 38*).—In this outline of plans for the administration and supervision of vocational education in South Dakota for the years 1919–21, the South Dakota State College of Agriculture and Mechanic Arts is recognized for teacher-training in vocational agriculture and home economics, and also the University of South Dakota for teacher-training in home economics.

The length of the teacher-training course in agriculture will be 4 years, or 216 unit hours. Not more than 40 per cent of the course may be given to technical and not more than 10 per cent to pedagogical subjects. The teacher-training course in home economics will extend over 4 years and consist of not less than 120 semester hours. It will include technical subjects embracing supervised home management 25 per cent or more, related sciences and arts 20 per cent or more, and pedagogical subjects 12½ per cent or more.

Provisions for observation and practice teaching in agriculture will be made in the high school classes of the State college, and practice teaching in home economics will be done in the Brookings high school and the agricultural high school. A practice cottage has been provided for supervised household management in which each student will be required to live for a period of 9 weeks. Itinerant teacher-training help will be given by the supervisor of home economics to teachers in service. Type courses in vocational agriculture and home economics and 4-year teacher-training courses in agriculture and home economics are outlined.

Agriculture for eighth year, M. C. Tex (*Taylorville, Ill.: Author, 1919, 6. ed., rev., pp. 152, fig. 1*).—The author has aimed to adapt this volume to the use of any class in the eighth year, following the present Illinois State course of study. The material is arranged by months and deals with beneficial and injurious insects and methods of combating them; the propagation of plants; animal husbandry; milk and its products; the home and school; the water supply in school and homes; air, weather, and lights and lighting; poultry, birds; and the improvement of home grounds.

The teaching of corn and corn culture in elementary agriculture, F. T. Ullrich (*Bul. State. Norm. School, Platteville, Wis., 17 [1919], No. 1, pp. 36, figs. 20*).—This bulletin includes suggestions on methods of presentation of an elementary study of corn and corn culture.

A year's work in vocational agriculture: Plant production, P. L. Guilbeau (*Dept. Ed. La. Bul. 10 (1919), pp. 79*).—This bulletin contains outlines of 154 lessons in plant culture, soils and fertilizers, and field crops; study outlines for corn, cotton, peanut, and potato projects; and laboratory exercises in general agriculture. The lessons aim merely to suggest the order of lessons and the subject matter to be presented which may be obtained from the numerous references given.

Laboratory exercises in plant production, A. W. Blanton, J. D. Blackwell, C. L. Davis, and C. A. Wood (*Dept. Ed. Tex. Bul. 107 (1919), pp. 34*).—This bulletin contains outlines of 76 exercises in plant production, and is intended to be used as a supplement to Bulletin 93, A Year's Work in Plant Production (E. S. R., 40, p. 492).

Laboratory exercises in animal production, A. W. Blanton, J. D. Blackwell, and C. L. Davis (*Dept. Ed. Tex. Bul. 106 (1919), pp. 26, fig. 1*).—This bulletin, which contains 110 exercises in animal production, is intended as a supplement to Bulletin 94, A Year's Work on Animal Production (E. S. R., 40, p. 492).

Use and preparation of food, compiled and edited by W. Windsor (*Fed. Bd. Vocat. Ed. Bul. 35 (1919), pp. 270*).—This bulletin has been prepared by the Federal Board for Vocational Education in cooperation with the U. S. Food Administration. It contains a series of short unit courses in the use and preparation of foods, suggested as a basis for instruction in day, part-time, and evening classes in home economics. The units, of from four to ten lessons each, are so grouped that they form a consecutive course when used together, yet each unit is complete in itself and may be used independently, or may be combined with one or more additional units to form a shorter course. Each lesson suggests the points to be brought out and the method of developing laboratory work. References to literature are included in each unit.

How teachers may use Farmers' Bulletin 1044, The City Home Garden, A. DILLE (*U. S. Dept. Agr., Dept. Circ. 33 (1919), pp. 8*).—Suggestions are offered on how teachers may use Farmers' Bulletin 1044 (E. S. R., 40, p. 833).

Gardening instructions for club members (*U. S. Dept. Agr., Dept. Circ. 27 (1919), pp. 16, figs. 11*).—Rules for beginning garden work, instructions for selecting the tenth-acre garden plat and preparation of the soil, setting the plants, cultivating the garden, and suggestions for making a hotbed are given in this circular.

Boys' agricultural club work in the Southern States, I. W. HILL and C. L. CHAMBERS (*U. S. Dept. Agr., Dept. Circ. 38 (1919), pp. 22, figs. 10*).—This outlines the objects of and gives directions for organizing and conducting boys' agricultural clubs in the Southern States. A suggested four-year course in club work is outlined.

Status and results of county agent work, Northern and Western States, 1918, showing war service of the county agent, W. A. LLOYD (*U. S. Dept. Agr., Dept. Circ. 37 (1919), pp. 16, figs. 7*).—In summarizing this report it is shown that, in addition to special war activities, a total of 77,868 demonstrations covering a variety of subjects were attended by 667,753 persons. The profit due to demonstrations on the demonstration areas alone is estimated at $22,206,307. If, therefore, "all the miscellaneous work of the agent, his numerous war activities, and the indirect influence of his work which can not be measured or expressed in terms of money value" be disregarded, "the profits to the farmer directly accruing from demonstrations personally conducted by the agents amounted to more than five times the total cost of the work to the Government, States, and counties."

NOTES.

Florida University and Station.—W. W. Flournoy, of DeFuniak Springs, has been appointed to the board of control vice J. T. Diamond. S. E. Collison, chemist to the station since 1911, resigned March 1.

Kansas College and Station.—A total of 484 students enrolled for the 8-weeks' short courses given in January and February. The enrollment in the farmers' short course was 123; in the tractor short course, 225; and in automechanics and other mechanical subjects, 136.

C. C. Cunningham has resigned to engage in farming after more than 12 years' service, chiefly in the cooperative experiments conducted by the agronomy department on farms throughout the State. Herschel Scott, instructor in soils, has resigned to take up commercial work in California. G. E. Lowrey has been appointed superintendent of the Tribune substation vice Ivar Mattson, resigned.

Minnesota Station.—An allotment of $100,000 has been made from the university building funds for the remodeling of the agricultural chemistry, horticulture, and agricultural botany buildings at University Farm during the summer of 1920, to provide additional class-room and laboratory space for the college and station. The construction of a recitation building at Morris, at an estimated cost of $75,000, and of an additional cottage at Crookston to cost $10,000, has also been authorized.

A short course for boy-scout masters will be held at the Itasca Park forestry substation for two weeks during August.

May Secrest resigned March 1 as State leader of home economics extension work, and has been succeeded by Julia O. Newton, formerly assistant State leader. Adele Koch has been appointed to the latter position.

Sam H. Thompson, in charge of farm management demonstrations at the Iowa College, has been appointed assistant professor of farm management beginning March 15. Holbrook Working, a graduate student in agricultural economics at the University of Wisconsin, has been appointed assistant professor of agricultural economics beginning September 15.

New Jersey College and Stations.—The Atlantic Division of the American National Red Cross is cooperating with the college in a short course for the training of leaders in Red Cross home service work from February 25 to April 20. Several of the station buildings will be utilized, and practical laboratory work will be given in the form of field trips and inspection of institutions in the State. F. G. Helyar, of the department of animal husbandry, is to give a course in rural economics and Mrs. Frank App, of the extension division, a course in homemaking, all other teachers being supplied by the Red Cross.

V. G. Aubry, extension specialist in poultry husbandry, resigned February 1 to engage in commercial work and has been succeeded by Irving L. Owen. John P. Helyar, State seed analyst and associate professor of botany, resigned March 1 to take up farming in Monmouth County.

EXPERIMENT STATION RECORD.

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EXPERIMENT STATION RECORD.

Vol. 42. MARCH, 1920. No. 4.

Conference of workers in a given field has long been recognized as profitable in advancing their work, and its advantage is especially noticeable in a field like agriculture. Such gatherings give opportunity for the exchange of ideas, for comparing notes on methods and results, and for developing the field of action. In agricultural extension, where the character of the enterprise is new and under development, the conference of workers has been common from the first and has materially assisted in formulating policy and methods. The field of research offers no less opportunity for advantageous consultation of specialists on means and ends, specific lines of inquiry, and the relating of such efforts in the most advantageous manner.

The annual meetings of the Association of Southern Agricultural Workers have for a number of years served as such a clearing house for problems and for organization in that section. These gatherings bring together a quite wide representation of the workers in various branches and departments of the field of agriculture. The association works through sections and special committees, while its general sessions deal with the more broad subjects common to the interest of all.

In this way a considerable range of subjects and of interests are covered, and there is opportunity for consideration by the specialists of broad questions relating to agriculture in the South, where various economic and other conditions such as the boll weevil, eradication of the cattle tick, labor situation, and land values are resulting in quite rapid changes. There is perhaps no section of the country which is more alive to these changes and to the questions of future development than the region represented by this association. Some of these matters are vital to the welfare of its basic industry.

The meeting of the association this year was held in Atlanta, February 24 to 26. The three days were filled with sessions of the general body, the sections of agronomy, animal husbandry, horticulture, phytopathology and extension, and with meetings of special committees to whom duties had been assigned. Among the topics uppermost were organization and cooperation in the study of typical questions applying to the region—the marketing of products, the storage of such staple crops as sweet potatoes, the development of pastures and grass crops, the control of soft pork, and the importance of developing an agricultural program for the Southern States.

The presidential address, by Dr. Tait Butler, referred among other things to the alarming condition of the personnel of the agricultural colleges, with many of the key men and their assistants leaving for commercial or other positions, and few young men in training to fill their places. This situation was ascribed to the low salaries in the colleges and stations, the meager increases which have come with the greatly changed scale of living costs, and the enlarged demand for experts in the industries. The specialists and teachers in these institutions were recognized as being absolutely fundamental to agricultural advancement under the program entered upon, and the present situation was seen to endanger the whole scheme. Economy which cripples the college and station staffs and discourages men from preparing for this field was felt to be very shortsighted. The effects of a depletion or lowered grade of the forces would be in evidence for many years, especially in the case of the station work which constitutes the advance guard.

A committee appointed to consider this subject, which was properly composed of persons not connected with these institutions, took very strong ground in urging that the matter should receive the attention it deserves at all the institutions, that a propaganda be carried on to acquaint the public and its representatives with the seriousness of the situation, and that everything possible be done to secure reasonable increases in salaries which would retain men of demonstrated ability. The committee was continued with power to act as the representative of the association in working toward this end by all proper means, and was instructed to report at the next meeting.

One of the notable topics of the convention, because of tis far-reaching importance and the breadth of the discussion, was that of an agricultural program for the southern States. In introducing the subject President Morgan, of Tennessee, made a forceful plea for a studied program for agriculture in the Southeast. Such a program is made more necessary by the changed agricultural status of that section in the past few years. Plans to more adequately meet this changed situation need to be worked out, with greater attention to cropping systems related to animal production, soil building, and types of agriculture which will more adequately employ the natural advantages of the section, especially the growing season. It was urged that the whole question of the effect of climate, health, educational facilities, and social and economic conditions on the development and prosperity of localities be taken up for systematic study; and it was suggested that a committee might aid in formulating plans for such a many sided investigation and open the way for carrying it forward.

Discussing this subject, Director Kilgore emphasized the soil survey as essential to the formulation of a permanent program, and strongly urged the maintenance of the proper balance of fertility in the soil. A point has been reached where this is feasible, but the trusteeship of the land is not yet adequately felt. Referring to the question of timber supply, concern was expressed over the rate at which the forest lands are being depleted, and a strong plea was made for an enlightened and aggressive forest policy. It was felt that such agricultural organizations should get behind a program of reforestation and control of forest devastation. A large part of the timber in the South is on farms, and it should be regarded as a farm crop even though it requires many years to produce it. Hence forestry should now constitute one of the main features of an agricultural program of the South.

Prof. J. F. Duggar likewise emphasized the great importance of an aggressive State forest policy to promote conservation and reforestation. In relation to the cropping systems he insisted that permanent agriculture should look to the growth of legumes, of which a long list are adapted, and to the maintenance of a proper balance between different kinds of crops, with phosphorus and to some extent lime supplied where indicated. The control of water on hillsides was pronounced a very large problem, and it was predicted that in the near future the unterraced field would predominate with provision for effective water control.

Prof. Duggar stressed the rural life factors in connection with agricultural development—the making of country life more attractive and satisfying from the standpoint of communication, education, social and religious opportunities, and recreation. Most of these things center in more adequate returns for products representing such large factors of labor and risk, and this gives prominence to cooperative marketing as the most promising means of attaining that end. It was thought the people could be more successfully brought together and organized around the dollar than around any other center, and hence that organizations for marketing might be readily expanded to include various social and other ends. To give better opportunity for the rural people to express themselves, it was thought that a smaller political unit than the county would often be of advantage and enable taking up many local questions of importance.

The relation of the railroads and of the chambers of commerce to the development of agriculture, marketing, transportation of products, etc., was discussed by others.

The grass situation of the coastal plain section was reviewed by Prof. J. R. Fain on the basis of quite extensive experiments, and was further discussed by others. This is one of the vital questions over a wide area, and affords much opportunity for experimental work. It appears that the need of such study is felt in a general way, but has not been given public expression, so that only meagre funds have been provided for it. It is fundamental to the development of the live stock industry, which in turn is closely connected with the restoration of fertility and the maintenance of permanent agriculture.

As in the past, the organization of investigation so as to promote cooperation, coordination and correlation, and direct attention to problems of outstanding importance, occupied a prominent place in the program. The subject was much in evidence in meetings of the sections and in plans presented before the whole body, and shows how largely the association is committed to the idea. It has promoted the spirit and gone a long way toward affording the necessary opportunity for such concerted or related action.

The agronomy committee on coordinating investigation in the South presented a constructive report which offered a series of quite definite recommendations bearing especially on lines of work and methods. Although changes in old projects may not always be feasible, it was urged that the coordination of new projects is highly desirable. A report from a similar committee on coordinating investigation in animal husbandry detailed cooperative experiments inaugurated at several stations on velvet bean meal for dairy cows, and studies in some half dozen States on soft pork; while a special committee on the soft pork problem presented a report with numerous suggestions for attack, and for standardizing methods and the measurement of results, to enable more ready comparison.

It appears that experiments in this latter field have consisted mainly of comparisons of different combinations of feeds in overcoming the effects of peanut feeding, given in a final or hardening period. Little has been done toward minimizing or counteracting the undesirable effect of peanuts during the period of growth and fattening, and only to a quite limited extent has the subject been approached from a physiological standpoint. The exact nature of the trouble and the nutritive defects or the physiological action to which the resulting product is due has received but little attention. The case is similar in this respect to that of cottonseed meal poisoning, so long the subject of experiments of the cut-and-try type. The results, therefore, are largely empirical and do not advance the subject as rapidly as its importance demands. It is a difficult question and undoubtedly calls for all the skill and guidance which physiology and the science of nutrition may be able to suggest, along with the results of well-controlled practical feeding trials. Eventually suggestions should be made which will enable mass experiments to contribute more largely to the final solution of the problem.

In a paper on The Organization of Investigation in Agriculture, the writer dealt with the systematizing of work within the individual stations as well as combinations between them to promote their studies. This is one of the livest subjects connected with research at the present time, and is likely to be far reaching in its effect on the organization of station work and the relations of the working force.

The organization of investigation logically begins with the individual station. The war led to a review of station projects and the stressing of certain ones of special importance. In a number of cases this has had a permanent effect and resulted in quite a thorough revision of the entire station program. Systematic attempts have been started at several stations to develop a program of work which would be not only more live, but more definitely adapted to the special problems and needs of their localities.

At one station, for example, a committee on projects was appointed to review the whole list, ascertain the status of each undertaking, the time it had been going, its relative importance, the progress it was making, its prospects, and the further work necessary for its completion. Working under the supervision of the director, this committee made a catalogue showing for each project, its relation to other work of the station, its adequacy, the future plans of the leader, and the publications issued upon it. In each case the leader met with the committee and discussed his projects, explaining their importance and in the end recommending what ones should be continued and what ones might be brought to a close as soon as feasible.

The advantage of such a review is apparent. Each project stood on its own merits. It was given searching examination by a committee of the leaders' coworkers. Some lines which had been drifting but had been consuming funds were detected and their future decided. In this way a conservative and safe means was provided of sifting out the less active or important lines as soon as practicable, and a basis furnished for a live active project list. It furnished the best possible means for establishing cooperation and coordination within and without the station.

At another station a research committee was organized to revise the project list in much the manner referred to above, but in addition to construct a program of station work designed to cover matters of prime importance and less dependent on chance or special preference. To this end the heads of departments, extension specialists and county agents in the State are engaged in canvassing the needs for investigation, and when brought together these will be weighed and incorporated in a comprehensive constructive program of investigation. It will show the ground to be covered and will thus serve to give direction to the station's efforts even though it is not practicable to cover the entire field at present. Other stations have taken similar steps, and there is much evidence that a general revision would be profitable and would help the stations at this time in adjusting themselves to the deficient revenues.

Most stations have too many projects. These are to some extent accumulations, and they represent a desire of individual workers to have a considerable list of undertakings. To this extent they embody a false idea, an ambition not in accord with the present views of investigation. It is desirable to encourage narrowing the scope in many cases, and organizing the work so that it will be more definitely centered in specific questions of limited range. The very fact that stations have as many as thirty, forty, and even a hundred projects shows how widely their efforts are being scattered, how far they fail of concentration.

The specialist with only two or three projects may accomplish far more for his own reputation and for the permanent benefit of practical agriculture than one who is attempting to carry a dozen or twenty, as some unfortunately are. It may be an aid to a man with a long list of projects to have this list reviewed by others in a sympathetic but critical manner, and account of stock taken. It helps him to discard or conclude those he may have been doubtful about and to direct his efforts along more constructive channels.

Such a scrutiny provides not only against a scattering of effort but against superficial, intermittent work. It may even affect the composition of the station staff. Station staffs have been made up in the past largely on the basis of departments instead of problems. The reason for this is clear; stations have often had to make the best of the material at hand. But with a larger number of persons now assigned primarily to research, the special needs of the station and the lines it plans to study may well figure in the search for a worker and the assignment of his duties. In other words, men may be sought to do definite things. Too often in the past a botanist or a chemist or an animal husbandman has been brought into the staff because there was a vacancy and then asked to outline some projects, and possibly told that as he was to be paid partly from the Adams fund he must get one or two lines that would fit that fund. More rarely, perhaps, is he advised of the station's program and invited to take hold of some phases of problems related to it, to occupy at least a part of his time.

It is becoming clearer every year that station work should in large measure be organized around problems. This naturally brings into prominence the relations of the various departments to these problems. Broad questions will often involve cooperation or a division of the inquiry between departments. This may mean either a close working together, or an approach from different standpoints, or the taking up of separate but essential aspects of the question. It may even involve one department working for another or under its direction for the time being.

Such organization will take account of the personnel. Some men are more resourceful in planning and conducting investigation than others. There are some who are natural leaders, and others who do their best work in association. It is the business of the director to determine this, and to use his force and facilities to the best possible advantage. It is one of his functions to study the workers and their work, to determine whether the latter is progressing as it should, to ascertain its needs if there are weak points, and to provide help from another department where it is required. He should form a judgment of the members of his staff and until he has there is little warrant for authorizing large undertakings. We ought to avoid experimenting with men as far as possible.

A man's inherent right to work independently depends first on his ability and his particular problems, and second on the requirements of the station program. Such right may never mean freedom from supervision or direction. This does not imply any narrow view, the sacrificing of ambition, or the subordination of individuality, but it implies loyalty to a cause and to an organization. It merely recognizes what has long been clear and freely admitted, that many of the intricate problems in agriculture are larger than any individual, and that their solution as completely and as rapidly as is humanly possible is something which the public has a right to expect of these institutions. The fact that the director and his staff constitute the experiment station, and that they themselves in very large measure initiate its working program, makes the station a singularly democratic institution in which loss of individuality need rarely be feared. Merit will tend to attain its proper level.

A natural effect of organization of work may ultimately be felt in the type of problems attacked. There will, of course, be many projects which aim at the settlement of some single fact or principle, or relate to some local question; but more and more the type of problems to be studied are those relating to broad, fundamental subjects of permanent character and having wide application. They bear ultimately on the formulation of good agricultural practice or policy, such as President Morgan and others discussed at this meeting. While they will be resolved into parts for study, the central purpose will inevitably call for relating the work of different departments to one another and suggest cooperation both in attack and in interpretation. General principles, broad underlying facts, and the understanding of their limitations and controlling factors, have a far more enduring value than results which relate only to minor questions or deal primarily with local aspects or conditions.

When the work of a station has been well organized, when each house has been set in order, the way is more clear for arranging for effective cooperation or coordination between stations. This should not be on too extensive a scale at the outset, and should be as free as possible from complications and cumbersome machinery. A small number of undertakings are more likely to succeed than if the attempt is made to bring a large part of the work of a section into cooperation. A few things well and satisfactorily done are more important than many less effective ventures. It is by success in cooperative effort that the plan will win friends and conviction, and will grow by its own force if the means are provided.

For most of the experiment stations the organization of their work with reference to what others are doing is no longer a matter of preference alone, but in a great measure is impressed upon them by present conditions. Insufficient funds make such action necessary if the stations are to cover the field and render the service expected of them. Individual workers and separate stations have their limitations; hence the attempt to combine their labors and their forces is a logical step. It should be realized that joint effort is a means of making the work of each station and of individual worker more effective.

The American stations comprise a system having a common purpose as well as local responsibilities, and confronted with many problems common to regions extending far beyond State boundaries. The stations do not exist merely to themselves or for their States. They have a unity of purpose, and a range of interest which are not confined to the local aspects of problems. They are interdependent. They can economize their time and funds and make their efforts more productive of sound conclusions by so relating their work as to cover certain problems quite completely, make the attack more concentrated, and the results more readily comparable or more intelligently harmonized.

Cooperation may lead to a more intensive study of the nature of the problem—what it really involves, what features or branches of science are included in its manifestations, and hence the means of approaching it, instead of viewing it from a one-sided, individualistic standpoint or in the practical form in which it comes up to the station. One great need is a more careful definition of problems. In agriculture they are unusually complex and the factors they embrace are often quite obscure. We are apt to see these problems in their composite character, as involved practical questions, rather than in their fundamental aspects. Attempts to solve them in such form lead to results which do not go far beyond the empirical.

Cooperation logically begins with the outlining of the problem and the making of the plan. It is here that a conference of minds contributing a breadth of knowledge and variety of views is of great advantage. Out of the exchange of ideas the real nature of the question at issue should be clarified, and carefully digested and effective plans for study evolved. Nothing can take the place of conferences in organizing problems and getting work started under them. Cooperation must be a democratic effort; a centralized, made-to-order plan to be followed rigidly by those who participate starts off wrong. The plans may be as simple and elastic as the subject will permit, leaving as much latitude as possible to individual initiative, preference and ingenuity. But while the effort should be largely informal, it should not be without coherence and follow-up or it will disintegrate into unrelated, independent activity.

The cooperative idea is making rapid progress and the agencies for promoting it are steadily increasing in number and in activity. The most important thing at the present time is to recognize the advantage and develop the spirit of cooperation. The next is to provide the opportunity and means for it. There needs to be a wider knowledge of what is being done and where, such as the Southern Agricultural Workers among others have attempted to provide, and there should be attempt to bring together those engaged in common undertakings. It is becoming more apparent that there is less and less to be feared from unworthy competition as a result of exchange of ideas, and more and more to be gained from combined and coordinated effort.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Yearbook of chemistry, edited by R. Meyer (*Jahrb. Chem., 24 (1914), pp. XI+478*).—This is the 1914 edition of the yearbook of pure and applied chemistry previously noted (E. S. R., 32, p. 801). In general the subjects and editors of the different sections are the same as in the 1913 edition.

Yearly report in regard to progress in animal chemistry, edited by R. Andreasch and K. Spiro (*Jahresber. Tier-Chem., 44 (1914), pp. 1296*).—This is the yearbook for 1914 of abstracts of the literature of the year on physiological, pathological, and immunochemistry and pharmacology in continuation of previous work (E. S. R., 34, p. 311).

Handbook of organic chemistry, edited by B. Prager and P. Jacobson (*Beilsteins Handbuch der Organischen Chemie. Berlin: Julius Springer, 1918, 4. ed., vol. 1, pp. XXXV+983*).—This is the first volume of the fourth edition of this well-known handbook of organic chemistry published by the Deutschen Chemischen Gesellschaft. This edition, as announced in the preface, is to consist of an entire revision of the work of previous editions, with the elimination of literature references that have become valueless and the introduction of material appearing since the last supplement to the previous edition up to and including 1910. This first volume deals with acyclic compounds, and the remaining three volumes are to cover the subjects of isocyclic compounds, heterocyclic compounds, and miscellaneous compounds not classified under the above headings.

Experiments on the action of unsaturated fatty acids and lipoids on amylolytic and hemolytic phenomena, P. Stocks (*Jour. Path. and Bact., 23 (1919), No. 1, pp. 1–14*).—Observations on the retarding action of unsaturated fatty acids and lipoids, the digestion of starch by diastase, and the influence of various substances on the hemolyzing power of oleates and saponin are reported, from which the following conclusions are drawn:

Sodium oleate and other oleates inhibit the action of diastase on starch and also the diastatic activity of normal blood serum, the inhibiting action exhibiting the quantitative character of a loose chemical combinaton between oleate and diastase. Pure fats and other substances were not found to inhibit diastase, and inactive human serum showed no antidiastatic power. The inhibiting action of oleates on the diastase-starch reaction is thought to afford a simple method of detecting and estimating oleates in a solution.

Oleates in sublytic concentration have the property of combining with washed red blood corpuscles to such an extent that they can be completely removed from a solution by separating the corpuscles with a centrifuge. The oleates can be completely removed from the oleate-corpuscle complex by hemolyzing the cells with distilled water, the oleates being then found in solution. The affinity of red corpuscles for oleates is more powerful than the affinity between diastase and oleates, as is shown by the fact that oleates can be removed from the diastase-oleate complex by the agency of corpuscles, leaving the diastase unchanged.

Saponin in sublytic concentration also enters into combination with washed red blood corpuscles. The hemolytic power of saponin is inhibited by cholesterin, which combines chemically with it. The cholesterin-saponin reaction is suggested as a method of estimating cholesterin in blood serum or body fluids containing cholesterin associated with other lipoids.

Okra seed oil, G. S. Jamieson and W. F. Baughman (*Jour. Amer. Chem. Soc., 42 (1920), No. 1, pp. 166–170*).—Seed of okra (*Abelmoschus esculentus*) obtained from Avery Island, La., yielded on expression 15.6 per cent of oil of a pleasing greenish-yellow color and a slight but fragrant odor. The press cake contained 5.88 per cent of oil. The oil gave the following constants: Iodin number (Hanus) 95.2, saponification number 195.2, Polenske number 0.23, Reichert-Meissl number 0.26, acetyl value 21.4, acid value 1.42, and refractive index at 25° 1.4702. The oil contained 0.37 per cent of unsaponifiable matter, and glycerids of fatty acids as follows: Palmitic acid 27.23 per cent, stearic acid 2.75, arachidic acid 0.05, oleic acid 43.74, and linolic acid 26.62 per cent. The oil reacted to the Halphen color test.

The composition of Hubbard squash seed oil, W. F. Baughman and G. S. Jamieson (*Jour. Amer. Chem. Soc., 42 (1920), No. 1, pp. 152–157*).—Data are reported from the Bureau of Chemistry, U. S. Department of Agriculture, on the composition of the expressed oil of Hubbard squash seed (*Cucurbita maxima*).

The crude oil is said to have a yellow color in thin layers and a brownish red color in layers of moderate thickness, while the refined oil is yellow with a red tinge. Both oils have a bland, fatty taste and a fatty odor. The physical constants of the crude oil are as follows: Specific gravity 25°/25° 0.9179, refractive index 25° 1.4714, iodin number (Hanus) 121, saponification number 191.5, Reichert-Meissl number 0.37, Polenske number 0.39, acetyl value 27.8, and acid value 0.5. The oil contained 1.06 per cent of unsaponifiable matter, 0.33 per cent of soluble acids, and 94.66 per cent of insoluble acids. The composition of the fatty acids of the refined oil calculated as glycerids was as follows: Palmitic acid 13 per cent, stearic acid 6, arachidic acid about 0.04, oleic acid 37, and linolic acid 44 per cent.

The crystallography of melezitose, E. T. Wherry (*Jour. Amer. Chem. Soc., 42 (1920), No. 1, pp. 125–128, figs. 3*).—The author describes the optical properties of crystals of melezitose, and indicates a method of examination of the crystals which develop in honeys.

The occurrence of melezitose in honey, C. S. Hudson and S. F. Sherwood (*Jour. Amer. Chem. Soc., 42 (1920), No. 1, pp. 116–125*).—Melezitose, previously found by the authors to be present in large amounts in a manna from the Douglas fir of British Columbia (E. S. R., 39, p. 802), has been identified in a sample of crystallized honey from Port Royal, Pa., and in two samples of honey from Maryland.

The origin of these three lots of honey was traced by E. T. Wherry to a sweet fluid deposited on the young twigs of the Virginia pine (*Pinus virginiana*) by a soft scale insect (*Toumeyella parvicorne* (?)), or at other times by an aphid (*Lachnus pinetí*), and collected and stored away by the bees. The fluid itself was found to contain melezitose, thus indicating that the bees do not synthesize it. The article contains a report by J. Kolinsky on the identity of the scale insect found on scrub pines, on the way such insects produce honeydew, and on the possibility of preventing melezitose.

Analytical data submitted by the authors on honey containing melezitose indicate that when a honey is found on analysis to show a large increase in reducing sugars by acid inversion, but a smaller increase by invertase hydrolysis, the presence of melezitose should be suspected. In such a case the melezitose may be crystallized by fermenting away the other sugar with baker's yeast. Honey which contains as much as 20 per cent of melezitose readily deposits crystals of this sugar.

Methyl and ethyl ammonium mercuric iodids: Their preparation, crystallography, and optical properties, G. S. Jamieson and E. T. Wherry (*Jour. Amer. Chem. Soc., 42 (1920), No. 1, pp. 136–145, figs. 6*).

The fixation of nitrogen in the form of hydrocyanic acid by means of the electric arc, E. Briner and A. Baerfuss (*Helvetica Chim. Acta, 2 (1919), No. 6, pp. 663–666*).—Attention is called to a possible method for the fixation of nitrogen in the form of hydrocyanic acid and ammonia by means of the action of an electric arc upon a mixture of methane and nitrogen. The greatest yield of HCN was obtained when 1 volume of methane and 5 of nitrogen were employed at a gaseous pressure of 100 mm. mercury and a potential difference of 505 volts.

Study of the catalytic oxidation of ammonia, P. Pascal and E. Decarrière (*Bul. Soc. Chim. France, 4. ser., 25 (1919), No. 9, pp. 489–507, figs. 11*).—A study is reported of the influence upon the catalytic oxidation of ammonia of various factors such as the form of the catalyst, the temperature of the reaction, the duration of contact, and the composition of the gaseous mixtures employed.

Balls of crumpled platinum foil proved superior to other forms of platinum as a catalyst, the yield not falling below 95 per cent within a temperature range of about 100°. The optimum temperature, about 650° C., was about 100° below the general optimum of the other catalyzers. The best mixture of gases proved to be one containing 25 per cent of oxygen. In most cases the ammonia not transformed into oxids of nitrogen was lost as nitrogen.

An electrolytic hydrogen generator for the laboratory, L. D. Williams (*Jour. Soc. Chem. Indus., 38 (1919), No. 17, pp. 355T, 356T, fig. 1*).—The generator described is a small-scale cell suitable for use as a substitute for the ordinary Kipp generator. The cell consists of a filter flask of 250 cc. capacity, fitted with a cork carrying a straight tube 30 cm. long and as large as the diameter of the cork will allow. This tube contains the anode, which is a strip of lead 25 cm. long, the lower end as wide as possible, and the remainder about 1 cm. wide. The upper end is soldered to a copper lead which supports the electrode so that the lower end is 1 cm. above the bottom of the tube. The cathode consists of a strip of lead foil thin enough to pass between the cork and the neck of the flask without causing any leakage, and extending nearly to the bottom of the anode tube. The electrolyte consists of 20 per cent sulphuric acid, which should nearly fill the flask when the exit is open.

It is stated that in use this cell will produce 7 cc. of hydrogen per ampère per minute. As an ideal plant for a small laboratory the author recommends 10 cells run normally at 1 ampère, a variable resistance to handle up to 3 ampères, an ammeter, and purifying apparatus.

A device for centrifugalization at low temperatures, W. H. Welker (*Jour. Lab. and Clin. Med., 5 (1919), No. 2, pp. 125, 126, figs. 3*).—The device consists of brass supports built to hold 100-cc. metal tubes and to fit snugly inside 500-cc. centrifuge cups. The supports should be approximately of the same weight, with their center of gravity located at approximately the same point. In practice the support and tube are placed inside the large cup, the space between the tube and the large cup is filled with water, and the water is frozen. The material to be separated is then placed in the small tube and centrifugalized in the usual manner. It is said to be possible to operate the machine at a speed of from 1,500 to 2,000 revolutions for from three to five minutes before all the ice has melted.

A device for preventing overtitration, O. Hackl (*Ztschr. Analyt. Chem., 58 (1919), No. 5, pp. 194–198*).—The author recommends as a simple device to obviate the necessity of back titration the use of a small long-stemmed funnel which is inverted in the beaker containing the solution to be titrated. When the end-point has been passed the funnel is lifted, releasing the small amount of solution enclosed. The definite end-point can then be quickly reached by the addition of a few drops of the standard solution.

The copper flame test for halogens in air, A. B. Lamb, P. W. Carleton, W. S. Hughes, and L. W. Nichols (*Jour. Amer. Chem. Soc., 42 (1920), No. 1, pp. 78–84, figs. 3*).—"By the simple expedient of making it cumulative the copper flame test for halogens in air has been rendered much more sensitive, so that as little as one part of halogen in fifty or a hundred million parts of air is readily detected. Moreover, the simplicity and rapidity of the test have not been sacrificed in the process.

"The results are sufficiently definite and reproducible to permit a fairly close estimate of the concentration of the halogen from the length of the accumulation period required to give a positive test."

Continuous process for nitrogen determination according to Dumas, L. Dexheimer (*Ztschr. Analyt. Chem., 58 (1919), No. 1, pp. 13–19, figs. 5*).—A modified Dumas apparatus for nitrogen determination is described, by means of which repeated determinations can be made without the loss of time entailed in the complete cooling of the apparatus. It is said to be possible to make from 15 to 20 determinations daily with the modified apparatus.

The determination of sulphate as strontium sulphate, I. M. Kolthoff and E. H. Vogelenzang (*Ztschr. Analyt. Chem., 58 (1919), No. 1, pp. 20–23*).—Previously noted from another source (E. S. R., 41, p. 205).

A new method for testing for phosphorus (*Wisconsin Sta. Bul. 302 (1919), p. 40*).—The method, devised by E. Truog, consists briefly in igniting the soil with magnesium nitrate, digesting with nitric acid, clarifying the resulting solution by centrifuging, and precipitating the phosphorus with ammonium molybdate in a specially designed tube in which, after centrifuging, the percentage can be read off directly. A complete determination can be made in one hour.

The determination of H-ion concentration in soil extracts and soil suspensions, J. Hudig and W. Sturm (*Dept. Landb. Nijv. en Handel [Netherlands], Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefsta., No. 23 (1919), pp. 85–127, figs. 10; abs. in Chem. Abs., 13 (1919), No. 22, p. 2945*).—The authors review existing methods of determining soil acidity, and describe a modified method of determining H-ion concentration suitable for solutions of sandy soils containing humus.

In the apparatus employed, which is illustrated by a diagram, the electrode consists of a gold-plated platinized gauze which is kept saturated with hydrogen. By means of a stirring device, the soil suspension is agitated during the determination and thus brought into more intimate contact with the hydrogen electrode.

The H-ion concentration of soil suspensions, as determined with this apparatus, was found to depend upon the temperature, the solubility of the soil, the time, the amount of stirring, and the presence of salts.

Methods for the determination of borax in fertilizers and fertilizer materials, W. H. Ross and R. B. Deemer (*Amer. Fert., 51 (1919), No. 13, pp. 66–69*).—The methods described are proposed by the Bureau of Soils, U. S. Department of Agriculture, as tentative pending the adoption of an official method. The details of the method as applied to the determination of borax in mixed fertilizers when present in small amounts (0.5 per cent or less) are as follows:

Weigh 5 gm. of the sample into a 250 cc. beaker, add 50 cc. of hot water, cover with a watch-glass, digest for 20 to 30 minutes on the water bath, filter, and wash into another beaker of the same size. Heat the solution to boiling, add 15 cc. of 10 per cent barium chlorid solution and then sufficient powdered barium hydroxid to give an alkaline reaction, boil for 15 or 20 minutes, filter, and wash. Evaporate the filtrate to dryness in a platinum or porcelain dish, and ignite the residue, preferably in a muffle furnace, at a temperature just below redness to destroy organic matter. Transfer the ignited residue to a 300 cc. flask, wash out the portion adhering to the sides of the dish with a little dilute hydrochloric acid, and add the washings to the flask. Sufficient acid should be used to give the contents of the flask an acid reaction. Attach the flask to a reflux air condenser, boil for 15 minutes to expel carbon dioxid, cool by placing the flask in cold water, and bring to neutrality by first adding 2 or 3 drops of methyl red solution (prepared by dissolving 0.1 gm. of methyl red in 100 cc. of a hot 50 per cent solution of alcohol and water and filtering) and then sufficient N/10 sodium hydroxid solution, standardized against standard boric acid, to change the color of the solution from pink to yellow. Add a gram or two of neutral mannite and a few drops of a 1 per cent solution of phenolphthalein in alcohol, and titrate the solution with the standard sodium hydroxid solution until a pink color develops. Add a little more mannite, and if the color disappears continue adding the standard alkali until the color again appears. Repeat the process until the addition of mannite has no further action on the end-point. The quantity of borax in the sample can be calculated from the volume of alkali required in the titration after the addition of the mannite.

Modifications of this technique are described for the determination of borax in mineral salts and in straight organic materials when present in small and in larger amounts.

Extraction and concentration of the water-soluble vitamin from brewers' yeast, T. B. Osborne and A. J. Wakeman (*Jour. Biol. Chem., 40 (1919), No. 2, pp. 383–394, figs. 4*).—An aqueous extract of brewers' yeast rich in the water-soluble vitamin has been prepared by the following procedure:

A quantity of moist yeast, weighing 4.5 kg. (equal to 830 gm. dried at 107° C.), obtained by diluting bottom yeast with ice water, centrifuging, and washing the sediment with ice water, was stirred slowly into 10 liters of boiling water containing 0.01 per cent acetic acid. After boiling about 5 minutes the extract was filtered through folded papers, the residue was washed once by boiling with 5 liters of 0.01 per cent acetic acid, and the washings, together with the main extract, were concentrated to 2 liters. This extract, which contained 140 gm. of solids equal to 16.9 per cent of the dry yeast, and 12.02 gm. of nitrogen, equal to 13.7 per cent of the original nitrogen or to 8.6 per cent of the solids of the extract, was found by feeding experiments with young rats to contain nearly all of the water-soluble vitamin of the yeast from which it was derived. A preliminary examination of the mixture showed that proteins were not present in amounts detectable by saturating with ammonium sulphate or by potassium ferrocyanid and acetic acid. The presence of relatively large proportions of nucleic acid, amino acids, and peptids was indicated, but these have not been isolated. Inorganic constituents were abundant, but phosphates were probably absent.

A further concentration of the vitamin can be effected by a fractional precipitation of the above extract with alcohol. The fraction containing by far the largest part of the vitamin originally present in the yeast was obtained as follows:

The extract prepared as described above was poured into 8 liters of 98 per cent alcohol and the flocculent precipitate filtered off. The filtrate and washings were concentrated to 300 cc. and poured into 1,960 cc. of 98 per cent alcohol. The precipitate formed was washed once with 79 per cent alcohol, dissolved twice in about 10 cc. of water, reprecipitated by pouring into enough alcohol to make the alcoholic concentration 90 per cent by weight, digested under absolute alcohol, and dried over sulphuric acid. The residue thus obtained equaled 6.2 per cent of the dried yeast, and contained 7.5 per cent of nitrogen and 10.65 per cent of ash. No greater amounts of the residue were required than of the original dried yeast to produce satisfactory growth in young rats, thus indicating that practically all of the original vitamin was present in this fraction.

Preliminary observations indicate that "a variety of substances are present in this fraction, but give no clue to the nature of the water-soluble vitamin."

The amboceptor fixation reaction, H. E. Reeser (*Meded. Rijksseruminricht., 2 (1919), No. 1, pp. 3–38, figs. 2*).—By means of the amboceptor fixation reaction the author has been able to distinguish beef and pork from horse, dog, and cat meat even when cooked or in sausage.

On the identification of citric acid in the tomato, R. F. Kremers and J. A. Hall (*Jour. Biol. Chem., 41 (1920), No. 1, pp. 15–17*).—The presence of citric acid in tomato juice has been shown by means of its triphenacyl ester, according to the method of Reid.[1]

Milk calculations: A reply, L. J. Harris (*Analyst, 44 (1919), No. 522, pp. 314–317*).—A reply to the criticism of Richmond (E. S. R., 41, p. 805).

Formula for calculation of added water in milk, L. J. Harris (*Analyst, 44 (1919), No. 522, pp. 317, 318*).—The author supplements his earlier formulas for calculating added water in milk (E. S. R., 41, p. 805), by one which may be used for samples which prior to watering contained an excess or deficiency of fat. The formula is as follows: $W=100-F-\frac{(100-f)}{n}N$, where W=added water, F=fat, N=solids-not-fat, and f and n=the standards for fat and solids-not-fat, respectively.

The Crismer number of butter, L. Vandam (*Ann. Falsif., 12 (1919), No. 131–132, pp. 260–269, figs. 3*).—A critical study is reported of the accuracy and limitations of the Crismer number for detecting adulteration in butter.

The author states that the determination should be made with an alcohol the water content of which has been determined from the critical temperature of solution in it of a standard petroleum or vaseline. A table is given of corrections to be made for the amount of water present in the alcohol. It has been found that the necessary correction for the acidity of the butter can be made by adding to the Crismer number the acidity calculated as the number of cubic centimeters of N/10 NaOH required for the neutralization of 4 cc. of the butter. With these corrections the method is considered to be of great value in detecting adulteration in butter.

Snuff and snuff substitutes, R. Hulbert (*North Dakota Sta. Spec. Bul., 5 (1919), No. 14, pp. 338–342*).—In connection with the enforcement of the antisnuff law in North Dakota, analyses were made of several brands of snuff and of fine cut chewing tobacco believed to be sold as substitutes for snuff. From the analytical data reported, the author is of the opinion that proof of the fact that a given brand of tobacco is snuff or a snuff substitute can not be furnished by chemical analyses until snuff has been arbitrarily defined by law on the basis of certain outstanding features, which should include fixed percentage limits for certain constituents such as moisture and ash and possibly also for ammonia, nitrogen, free nicotin, and nitrates.

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[1] Jour. Amer. Chem. Soc., 39 (1917), No. 1, pp. 124–136.

About a new stomach examiner, based on the hydraulic principle, K. TOGAMI (*Jour. Lab. and Clin. Med., 5* (*1919*), *No. 3, pp. 178–184, figs. 2*).—An aspirating apparatus, by means of which negative pressure is produced automatically by water pressure, is described in detail with accompanying diagrams. The apparatus can be used with suitable modifications in technique for the aspiration of the gastric contents, the aspiration of gas or gases in the stomach, the volumetric measurement of the gas in the stomach, and the estimation of the capacity of the stomach. A simple transportable form of the apparatus based upon the same hydraulic principle is also described.

The determination of saccharin in urine, G. S. JAMIESON (*Jour. Biol. Chem., 41* (*1920*), *No. 1, pp. 3–8*).—The method, contributed from the Bureau of Chemistry, U. S. Department of Agriculture, is based upon the quantitative extraction of the saccharin with ether from the acidified urine previously treated with normal lead acetate and filtered. The residue from the ether extraction is fused with sodium carbonate and the sulphur determined as barium sulphate. The amount of saccharin is then calculated after making a correction for the blank by multiplying the weight of the barium sulphate by 0.7844.

Cider- and vinegar-making qualities of Minnesota apples, W. G. BRIERLEY (*Minnesota Sta. Bul. 185* (*1919*), *pp. 34, figs. 6*).—This bulletin contains the detailed report of an investigation of the value of Minnesota apple varieties for cider and vinegar, a preliminary report of which has been previously noted from another source (E. S. R., 39, p. 316).

It is estimated that under existing conditions cider can be made with a hand press at a cost varying from 16.5 to 24 cts. per gallon on the basis of a production of 200 gal. The slight loss from evaporation and the extra handling involved in the manufacture of vinegar would increase the cost of the latter by 1 or 2 cts. per gallon.

Illustrations are given of the barrel and press cloth type of presses, the latter of which was found to produce the greater yield. The data reported include tables of the yield, flavor, and quality of ciders from different varieties of Minnesota apples, analyses of these ciders, and their vinegar-making records.

Primost (whey sugar) as a substitute product (*Wisconsin Sta. Bul. 302* (*1919*), *pp. 48, 49*).—A mixture of primost, the granular residues obtained by boiling whey, with glucose has been found by J. L. Sammis to be practical as a substitute for sugar in candy manufacture in cases where glucose alone can not be used on account of its sticky physical condition.

METEOROLOGY.

Comparison of methods for computing daily mean temperatures: Effect of discrepancies upon investigations of climatologists and biologists, F. Z. HARTZELL (*New York State Sta. Tech. Bul. 68* (*1919*), *pp. 35, pls. 2, figs. 19*).—A comparative study of temperature data obtained during 1916 at the Vineyard Laboratory at Fredonia, N. Y., from readings of standard maximum and minimum thermometers and from a continuous thermograph record showed certain discrepancies in averages, which are discussed in detail in this bulletin from the standpoint especially of biological investigations.

"No record based on maximum and minimum temperatures was found as accurate as the thermograph average, and the nearer to midnight these readings were taken the closer did the daily averages approximate the truth. The annual mean temperature, calculated from records taken at 8 p. m. or later, gave differences so slight as to be negligible, and, for this reason, the records of the cooperative observers of the U. S. Weather Bureau are reliable for biological workers, so far as the annual mean temperature is concerned.

"Monthly mean temperatures, computed from the highest and lowest temperatures for each 24 hours when the hour of observation occurs not earlier than 8 p. m., while safe for climatological purposes may introduce errors of importance to ecological workers, and so recourse should be had to temperature curves in order to determine the discrepancies. . . . Averages to be compared should be calculated from readings taken at the same hour, otherwise erroneous conclusions may be drawn. . . . The taking of readings before 8 o'clock in the afternoon is not to be recommended for any purpose, owing to the extreme differences that will be introduced in the averages.

"Daily mean temperatures determined by approximate methods are practically worthless for exact comparisons of temperature data from day to day as is demanded by zoological and botanical investigations under natural conditions. Also these means are the cause of errors of considerable magnitude in the summation of temperatures or indexes, especially the former, during the spring months. To secure accurate averages of all kinds, the ecological worker should rely upon thermograph records which have been checked, and, if necessary, corrected from readings of maximum and minimum thermometers of precision."

The characteristics of the free atmosphere, W. H. DINES (*Met. Off. [Gt. Brit.], Geophys. Mem., No. 13 (1919), pp. 45–76; abs. in U. S. Mo. Weather Rev., 47 (1919), No. 9, pp. 644–647*).—This is a summary of data and conclusions published in previous papers. The subject is discussed under the headings of (1) methods and places of observation, (2) amount and reliability of material, (3) mean temperatures and gradients, (4) the seasonal variation, (5) the daily temperature range, (6) the humidity, (7) the troposphere and stratosphere, (8) pressure and density, (9) the motion of the free atmosphere, (10) statistical data, (11) the connection between pressure and temperature, and (12) the vertical temperature gradient and the value of H_e. An appendix deals with "the standard deviations of the density of the air from 1 to 13 km., and the frequency of occurrence of deviations of given magnitude."

Rainfall interception, R. E. HORTON (*U. S. Mo. Weather Rev., 47 (1919), No. 9, pp. 603–623, pls. 2, figs. 11*).—This is an analysis of the available data on the subject, including observations at the author's hydrologic laboratory, near Albany, N. Y., of which the following is a synopsis:

"Rainfall interception represents a loss of precipitation which would otherwise be available to the soil. The loss takes place through evaporative processes, but may, for convenience, be subdivided into (1) interception storage, and (2) evaporation during rain.

"The amount of interception loss is primarily a function of the storage capacity of the plant surface, the duration of precipitation, and the evaporation rate during precipitation. Since there is generally a fairly close correlation between shower duration and amount of precipitation, estimates of interception loss can, for practical purposes, be expressed in terms of precipitation amount per shower. The interception storage loss for trees varies from 0.02 to 0.07 in. per shower, and approaches these values for well-developed crops. The interception storage loss for trees in woods is greater, but the evaporation loss during rain is less than for trees in the open. The percentage of total precipitation loss is greater in light than in heavy showers, ranging from nearly

100 per cent where the total rainfall does not exceed the interception storage capacity to about 25 per cent as an average constant rate for most trees in heavy rains of long duration. Light showers are much more frequent than heavy ones, and the interception loss for a given precipitation in a month or season varies largely, according to the rainfall distribution. Expressing the interception loss in terms of depth on the horizontal projected area shadowed by the vegetation, the loss per shower of a given amount is very nearly the same for various broad-leaved trees during the summer season.

"The amount of water reaching the ground by running down the trunks of trees may amount to a relatively large volume when measured in gallons for a smooth bark tree in a long, heavy rain. It is, however, a relatively small percentage, commonly 1 to 5 per cent, of the total precipitation. The percentage increases from zero in light showers to a maximum constant percentage in heavy showers of long duration. Different interceptometers under the same tree will give fairly consistent results, if so placed that they do not receive direct rainfall, and if they stand under a complete leaf cover of average density. So far as the experimental data go, there is little evidence of watershed effect or dripping of water from the periphery of the crown to a greater extent than through the crown itself. The interception loss from needle-leaved trees, such as pines and hemlocks, is greater both as regards interception storage and evaporation during rain than from broad-leaved trees.

"The average duration of showers of a given intensity is greatest in winter and the colder summer months, and least in midsummer or thunderstorm months, whereas the evaporation rate is greatest in midsummer and least in the colder months. As a result of the opposite effects of these two factors affecting interception loss, the average loss per shower of a given intensity seems to be nearly constant throughout the different months of the summer period, May to October, inclusive. Data are insufficient for a final determination of the relative losses from trees in winter and in summer. Apparently the winter and summer losses for a given monthly precipitation for needle-leaved trees are about equal, whereas for deciduous, broad-leaved trees the winter interception loss appears to be about 50 per cent as great when the trees are defoliated as during the growing season. Interception loss from full-grown field crops approaches in value that from trees, but owing to the short time during which crops stand on the ground in a fully developed stage of growth, the total annular interception loss from cropped areas is very much smaller than from wooded areas. The average interception loss from 11 trees, excluding peripheral interceptometers and excluding hickory, for which the results are defective, during the summer of 1918 was 40 per cent of the precipitation."

The construction of the special forms of interceptometers used by the author under trees and attached to their trunks is described.

The seasonal distribution of precipitation and its frequency and intensity in the United States, J. B. Kincer (*U. S. Mo. Weather Rev., 47 (1919), No. 9, pp. 624–631, pls. 16, figs. 17*).—This article gives and explains "12 monthly charts and 1 for each of the four seasons, together with auxiliary maps for the seasons showing the percentage of the annual precipitation that occurs in each. The monthly and seasonal charts are based on all available records of sufficient length for such use, about 3,600 in number reduced to a uniform 20-year period. There are, in addition, a number of graphs showing for selected stations representing various rainfall types the total precipitation in each season for each of the 20 years on which the maps are based. These show the relative variations in amount that may be expected from year to year in different sections of the country, and also give an indication of the dependability of the averages. In localities where the dispersions about the mean value are small, the latter is more indicative of the amount likely to be received in a particular year than those where wide variations are shown by the graphs. Departures from year to year from the average precipitation vary in magnitude inversely with the length of the season considered. The relative variations from the mean for the annual, the summer-half year, each of the four seasons, and for each of the 12 months, are graphically shown in such manner as to admit of direct comparison."

Auxiliary charts for use in comparing the frequency with which significant amounts of precipitation occur, the intensity of falls, and the subnormal frequency and duration are also given, as follows: "The average number of days annually with precipitation from 0.01 in. to 0.25 in. in 24 hours; the average number of days annually with 0.26 to 1 in.; the average annual number with more than 2 in.; the average annual number with more than 1 in. in an hour, and the maximum precipitation in 24 hours for the entire 20-year period. Also, the percentage of years east of the Rocky Mountains with 30 consecutive days or more without 0.25 in. of rainfall in 24 hours from March to September, inclusive, and the greatest number of consecutive days without 0.25 in. in 24 hours for the same months. These auxiliary charts are based on the records of all regular reporting stations for the 20-year period from 1895 to 1914."

It is shown in general that "considering the areas covered and their climatic importance, there are three major types of seasonal distribution of precipitation in the United States. These are the Pacific type, with a marked winter concentration; the Plains type, with relatively heavy rainfall in the late spring and early summer; and the Eastern type, with comparatively uniform distribution throughout the year. The Arizona and Florida types are pronounced in character, but the areas covered are comparatively small and consequently their climatic significance is less important. The Sub-Pacific type is not only less marked in distinguishing features than most of the major types mentioned, but precipitation is scanty throughout the year in much of the area covered by it, which, in considerable sections, precludes extensive crop growth without the employment of special methods of conservation of soil moisture or the artificial application of water to growing vegetation."

Normal precipitation in Utah, J. C. ALTER (*U. S. Mo. Weather Rev., 47 (1919), No. 9, pp. 633–636, pl. 1, figs. 5*).—A chart is given which "has been prepared from all authentic data available at the close of the year 1918, the records having been adjusted as nearly as possible to the 26-year period, 1893–1918, and the interstation interpolations having been made with every practicable consideration for topographic influences. The records used have been made principally in the settled communities where cooperative observers were available, at an average altitude of about 5,250 ft. above sea level. . . . About 180 localities are represented in all. . . .

"The general average annual precipitation is about one-third as much as in Illinois, the dearth being due to distance from the Pacific Ocean, which is the principal moisture source, and to the interception of the moisture-bearing winds by the coast ranges and Sierra-Cascades. The Wasatch Mountain range forms the principal topographic control of precipitation within the State, as it intercepts most of the storm tracks at about right angles; its westerly slopes, therefore, as well as the northerly slopes of the Uinta Mountains, receive the State's heaviest precipitation. A comparatively heavy precipitation is also wrested from passing storms by the La Sal and Elk Mountains and their surrounding plateau lands in southeastern Utah. Contrariwise, the depressions over western Utah which formed the bottom of the prehistoric Lake Bonneville (the Great Salt Lake Desert) is the State's most arid region. The slightly higher plains regions of western Utah generally, from which rise numerous ranges of hills and minor mountains, and the broad basins of the Green and the Colorado Rivers in eastern Utah, are also relatively arid, as a rule."

The precipitation of the State, as shown by the records, is therefore "least in the depressions and greatest on the higher windward slopes of the mountains generally, the amount being about 10 times greater on the higher mountains than on the depressions to windward. The increase with altitude is about 4 in. per thousand feet on the windward or western slopes, and about 5.5 in. per thousand feet on the opposite side of the mountain ranges which intercept storm tracks. A slight decrease is shown near the crests, and the increase begins some distance to windward of the mountains. An important nonconformity appears on slopes which are interrupted by important initial barriers, beyond which there is sometimes a decrease and always a change in the rate of increase. The windward sides of intermediate valleys are drier usually than the leeward sides.

"Secular variations in annual and monthly amounts are shown to be without uniformity or reliability. Decade means for every consecutive 10 years in several groups of stations show variations amounting to from 15 to 19 per cent of the 26-year means. The stability of 26-year and longer means is shown to be within 3 per cent the addition of any 10 years' record changing the mean no more than this amount. Certain supposedly wet or dry cycles are shown to be of opposite value or absent from a number of months and stations, and the January to May precipitation is shown to be comparatively stable and subject to less fluctuation. Types of monthly distribution are presented."

Historical data on the variation of rainfall in Chile, C. E. P. Brooks (*U. S. Mo. Weather Rev., 47 (1919), No. 9, pp. 637, 638*).—This is a note on a book published by B. V. Mackenna in 1877, which "contains numerous researches into the municipal archives at Santiago. These are summarized, and shown to suggest two periodicities in rainfall: (1) A variable 'Brückner period'; (2) a period of about 108 years. In addition, the eighteenth century was drier than the nineteenth."

The relation of wind direction to subsequent precipitation in central Ohio, H. H. Martin (*U. S. Mo. Weather Rev., 47 (1919), No. 10, pp. 730–733, figs. 5*).—Tables and graphs are given which show the relation of wind direction to seasonal precipitation and to precipitation within subsequent 12-, 24-, and 48-hour periods.

These show a positive relation between certain surface wind directions and subsequent rainfall. They indicate that "in the winter, southeast winds are of greatest importance as harbingers of rain [within the subsequent 24 hours], while in the spring the south wind is of predominating value. The relation between wind and precipitation during the summer and autumn is relatively small, and the west wind appears of increased value."

The prognostic value of the wind direction for the subsequent 48 hours differs decidedly from that for the 24-hour period. In each case the southeast wind appears to be of greatest prognostic value during the winter months, but for the 48-hour period the east and south winds are also of importance.

During the spring the south wind continues predominant and increases in value appreciably, but the west wind shows the first positive relation to subsequent rainfall. During the summer months, it attains the position of being the rainy wind of the season, showing a high positive value. The winds east to south also increase in value and may be considered favorable indications of coming showers. In the autumn, there is indicated but a slight relation of the south wind to approaching rain; all other directions being of no importance whatever.

In all cases "a rain wind will, if observed at sunset, be followed by precipitation with a far greater degree of certainty than the same wind direction observed in the morning."

Relation of snowfall to the yield of winter wheat, C. J. Root (*U. S. Mo. Weather Rev., 47 (1919), No. 10, p. 700, figs. 4*).—Four diagrams, computed from data for yield of wheat and temperature and snowfall in Illinois, and "showing the yields of winter wheat and the snowfall, mean and lowest winter temperatures in the preceding winters, with respect to the averages of these features for the period of record," are presented. It is stated that "considering only the elements of total snowfall and mean temperature, it would appear that the winters of light snowfall are followed by good wheat yields, and the winters of heavy snowfall are followed by light yields. However, this may be due in part to the fact that the temperature is less severe in the winters of light snowfall."

Effect of snow on winter wheat in Ohio, J. W. Smith (*U. S. Mo. Weather Rev., 47 (1919), No. 10, pp. 701, 702, fig. 1*).—Data for snowfall and yield of winter wheat in three counties in Ohio are presented, which indicate that "in northwestern Ohio a heavy snowfall in January is slightly favorable, has little or no influence on the final yield if it comes in February, but a decidedly adverse influence if in March. . . . The general opinion is that winter grains should be covered by snow during cold weather and more especially when freezing and thawing conditions prevail. The results of studies in Ohio . . . show little to substantiate this opinion, at least during part of the winter."

Monthly Weather Review (*U. S. Mo. Weather Rev., 47 (1919), Nos. 9, pp. 603–690, pls. 37, figs. 37; 10, pp. 691–768, pls. 27, figs. 33*).—In addition to detailed summaries of meteorological, climatological, and seismological data and weather conditions for September and October, 1919, and bibliographical information, reprints, reviews, abstracts, and minor notes, these numbers contain the following contributions:

No. 9.—Rainfall Interception (illus.), by R. E. Horton (see p. 317); The Seasonal Distribution of Precipitation and Its Frequency and Intensity in the United States (illus.), by J. B. Kincer (see p. 318); Normal Precipitation in Utah (illus.), by J. C. Alter (see p. 319); Historical Data on the Variation of Rainfall in Chile, by C. E. P. Brooks (see p. 320); A Tornado Within a Hurricane Area (illus.), by R. W. Gray; Tornado Near Hobbs, N. Mex., September 19, 1919, by E. H. Byers; Heavy Rainfall in New Mexico, September 14–17, 1919 (llus.), by C. E. Linney; and Vertical Temperature Distribution in the Lowest 5 Kilometers of Cyclones and Anticyclones, by W. R. Gregg.

No. 10.—The Evolution of the Snow Crystal (illus.), by J. C. Shedd; An Improved Form of Snow Sampler (illus.), by B. C. Kadel; Snow and Railway Transportation (illus.), by A. H. Palmer; Relation of Snowfall to the Yield of Winter Wheat (illus.), by C. J. Root (see above); Effect of Snow on Winter Wheat in Ohio (illus.), by J. W. Smith (see above); Taylor's Theory of Atmospheric Turbulence, by E. R. Miller; Humidity and Vapor Pressure at Tampa, Fla., by W. J. Bennett; The Relationship Between Cirrus Movements from Easterly Points and the Occurrence of Severe Droughts (illus.), by G. Reeder; Easterly Movement of Cirrus Clouds (illus.), by L. J. Guthrie; The West India Hurricane of September, 1919, in the Light of Sounding Observations (illus.), by R. H. Weightman; Intense Rainstorm of October 4, 1919, at Dubuque, Iowa, by J. H. Spencer; Intensity of Precipitation, by W. J. Humphreys; Panama Thunderstorms (illus.), by H. G. Cornthwaite;

Note on Pilot-Balloon Flights in a Thunderstorm Formation (illus.), by I. R. Tannehill; Waterspout Observed at San Juan, Porto Rico, September 10, 1919 (illus.), by W. C. Haines; Ball Lightning at Salina, Kans.; Lightning Holes; The Relation of Wind Direction to Subsequent Precipitation in Central Ohio (illus.), by H. H. Martin (see p. 320); Probability of Rain in Summer at Atlanta, Ga., by W. W. Reed; Some Winter Weather Signs in Utah (illus.), by J. C. Alter; Clouds as Gale Prognostics on the North Atlantic Coast, by E. S. Clowes; The Flood Months in the United States, by A. J. Henry; and Floods on Lower Rio Grande, by A. J. Henry.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and G. A. Smith (*Massachusetts Sta. Met. Buls. 371–372 (1919), pp. 4 each*).—Summaries are given of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during November and December, 1919. The general character of the weather for November is briefly discussed, and the December bulletin gives a summary for the year. The principal data in this summary are as follows:

Mean pressure 30.034 in.; mean (hourly) temperature 48.3° F., maximum 101° June 3, minimum —9° December 18; total precipitation 41.42 in., snowfall 24.5 in.; cloudiness 1,831 hours; bright sunshine 2,569 hours; prevailing direction of wind, west, total movement 52,335 miles, maximum daily 580 miles March 29; last frost in spring May 1, first in fall September 18; last snow April 25, first November 5.

[Climatic conditions on the Belle Fourche reclamation project in 1918], B. Aune (*U. S. Dept. Agr., Dept. Circ. 60 (1919), pp. 3, 4*).—Observations during 1918 at the Belle Fourche Experiment Farm near Newell, S. Dak., on temperature, precipitation, evaporation, winds, and killing frosts are summarized and compared with similar data for the 11 years, 1908–1918.

A maximum temperature of 100° F. occurred in June, July, and August, 1918; a minimum of —33° in January. The last spring frost occurred May 21, the first fall frost September 19, the frost-free period being 120 days as compared with an 11-year average of 131 days. The precipitation in 1918 was 18.31 in. as compared with the 11-year average of 14.28 in. The rainfall of May and June was very light, that of July, August, and September abnormally heavy. Evaporation (April to September) was 32.52 in. in 1918 as compared with the 11-year average of 36.58 in.

SOILS—FERTILIZERS.

Soil survey of Burke County, Ga., E. T. Maxon, C. E. Deardorff, W. A. Rockie, and J. M. Snyder (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 31, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture, deals with the soils of an area of 519,680 acres, lying directly east of the center of Georgia. The topography is prevailingly undulating to rolling.

The soils of the country are all typical of the Atlantic coastal plain, being more or less sandy at the surface and underlain at variable depths by sandy clay and clay. With reference to origin and formation the soils are classed as upland and alluvial soils. Including swamp, 15 soil types of 11 series are mapped, of which the Norfolk sandy loam is the most extensive type, covering 32.4 per cent of the area, and is considered one of the most desirable for cotton. The Norfolk sand covers 22.7 per cent of the area, and the Ruston sandy loam, in two phases, covers 11.9 per cent.

Soil survey of Washington County, Md., R. T. A. BURKE and H. F. MCCALL (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 46, fig. 1, map 1*).—This survey, made in cooperation with the Maryland Geological Survey and the Maryland Experiment Station, deals with the soils of an area of 293,760 acres in northwestern Maryland, lying wholly within the Appalachian and Limestone Valley provinces. The topography ranges from gently rolling in the great valley to rolling or hilly, or mountainous in the Appalachian section.

With reference to origin, the soils of the county are classified as Great Valley soils, derived from blue and white limestone rock, soils derived from sandstone, shale, and quartzite, soils derived from igneous rocks, colluvial soils, and alluvial soils, the first three types being residual in origin. Including rough stony land, 26 soil types of 16 series are mapped, of which the Hagerstown silt loam and Hagerstown clay loam cover 33.4 and 10.9 per cent of the area, respectively. The soils of the Hagerstown series are considered to be the most valuable types for general farming.

Management of sandy soils (*Wisconsin Sta. Bul. 302 (1919), pp. 41–43*).—Rotation experiments on the improvement of sandy soils conducted at the Hancock substation, in which a 3-year rotation of rye seeded to Mammoth clover, hay the second year, followed by corn, was used in one case; and a 4-year rotation used in the second case, which was the same as the first except that soy beans were planted the fourth year, showed that there was an operating loss of nearly $1,000 in three years. An inventory of the soils assets, however, was taken to indicate that this loss is fully covered by the increased value of the fertility of the land. The results also indicate that commercial fertilizers in connection with green manuring crops will produce a material increase in the yield of nearly all crops. The addition of lime likewise proved very beneficial in building up these acid soils.

Management of the Superior red clay (*Wisconsin Sta. Bul. 302 (1919), p. 44*).—Experiments with tillage at the Ashland substation, which involved a comparison of spring and fall plowing and of 6-in. fall plowing with various other tillage methods applied once in four years on corn land, showed that the use of the Spaulding deep-tilling machine in comparison with 6-in. fall plowing was followed by an increase of 1.6 bu. with a 28-bu.-to-the-acre barley crop in favor of the deep tillage; also a marked increase in clover and timothy hay was noted. Subsoiling compared with fall plowing resulted in a 4-bu. increase with a 30-bu. crop. In the case of small grains fall plowing was decidedly better than spring plowing, while the opposite was the case with clover and timothy.

Effect of variation in moisture content on the water-extractable matter of soils, J. C. MARTIN and A. W. CHRISTIE (*Jour. Agr. Research* [*U. S.*], *18 (1919), No. 3, pp. 139–143*).—In this article, a contribution from the California Experiment Station, experiments to determine to what extent variations in moisture content of soils modify the magnitudes of their water extracts are reported.

The soils studied were a silty clay loam and a sandy loam. The silty clay loam was studied at moisture contents of 10, 15, 20, and 25 per cent, and the sandy loam at moisture contents of 5, 10, 15, and 20 per cent.

It was found that the moisture contents approaching the air-dry condition showed a decided tendency to depress the nitrates and potassium in both soils and the sulphates in the silty clay loam only. These depressions were reflected in the total dissolved material. The excess water in the sandy loam soil caused a disappearance of nitrates and also decidedly depressed the potassium, calcium, and magnesium, these losses also being reflected in the total solids extracted. It is concluded that considerable variations in moisture contents of soils, provided the saturation point is not reached, do not appreciably modify the results obtained by the water-extraction method.

Nature of soil acidity (*Wisconsin Sta. Bul. 302* (*1919*), *p. 40*).—E. Truog and C. S. Pettis have found that when an insoluble acid like stearic acid and acid soils were subjected to treatment with various salt solutions, the insoluble acid acted in a similar manner to the acid soils.

Soil acidity and the seeds of plants (*Wisconsin Sta. Bul. 302* (*1919*), *pp. 38–40*).—Studies of soil acidity by E. Truog have indicated that soil acids prevent plants from securing adequate amounts of lime from the soil to meet their needs. Such plants as sugar beets, cabbage, rape, and barley are as seriously affected as the most sensitive legumes, indicating that the harmful action of soil acids is not directly due to an effect on the root bacteria.

A comparison of methods for determining soil acidity and a study of the effects of green manures on soil acidity, H. H. Hill (*Virginia Sta. Tech. Bul. 19* (*1919*), *pp. 3–25*).—A comparative review of different methods for determining soil acidity is given, particular attention being paid to the Veitch and Jones methods. It is stated that the Veitch method, although quite reliable, is long and tedious. The Jones method is rapid and on comparison with the Veitch method gives fairly concordant results, approaching very near the actual field conditions.

Greenhouse and field experiments with five of the leading Virginia soil types, ranging from sandy loams to heavy clays, are reported in which additions were made of cellulose, rye straw, clover, soy beans, and blue grass. It was found that the incorporation of plant tissue produced a very slight increase in soil acidity. In pot experiments the green manures did not inhibit a vigorous nitrate development, and plant growth was materially increased. In the field experiments, using soy beans, buckwheat, red clover, and rye, with corn and wheat, no marked acidity was developed during a 5-year period. The turning under of the green manure crops was not detrimental to a strong nitrate production, nitrogen fixation, and plant growth.

With field experiments where the green crops were turned under at intervals of two weeks throughout their development, no injurious effects were observed as a result of this practice, and after the second crop had been turned under the lime requirement of the soil was diminished rather than increased. Rye showed a decided initial acidity, but this condition quickly passed off. The indications were that this initial acidity was not of serious harm to the plant on account of its transitory nature. The common belief that a green manuring practice is a harmful one was not substantiated by the results obtained. From the results obtained on soils receiving green manures, the general tendency was toward the creation of an alkaline condition in the soil rather than an acid one.

It is concluded that "in a well-planned rotation, taking into consideration the loss of bases in the drainage water and the restoration of these bases by means of moderate applications of lime at regular intervals, little if any harm should result from the turning under of green crops as a means of replenishing the store of organic matter in the soil."

Influence of acidity on growth of legume bacteria (*Wisconsin Sta. Bul. 302* (*1919*), *p. 46*).—Studies by E. B. Fred and A. Davenport have shown that the bacteria associated with alfalfa are very sensitive to acid, while the soy bean and lupine bacteria are much less affected by an acid reaction. It is concluded that when the soil is favorable for the plant it will also be favorable for the bacteria associated with the particular plant.

The use of the nitrate-reduction test in characterizing bacteria, H. J. Conn and R. S. Breed (*New York State Sta. Tech. Bul. 73* (*1919*), *pp. 21; also in Jour. Bact., 4* (*1919*), *No. 3, pp. 267–290*).—Experiments with four types of soil and water bacteria led to the conclusion that the nitrate-reduction test, as made by testing for nitrate in standard nitrate broth after a definite period of incubation, is not so simple as generally supposed and is open to several sources of error. "In case of each of the four species (or groups of species) studied, a different explanation was found necessary to account for cultures showing no nitrite. Only in one case, that of *Bacillus cereus*, did investigation show the possibility of two species being concerned, one differing from the other in its ability to reduce nitrate. Inasmuch, therefore, as nitrate-reduction on any medium or under any conditions whatsoever indicates an organism as a nitrate-reducer, the general conclusion of the present work is that no organism can be safely called a nonnitrate-reducer except as the result of exhaustive tests, too time-consuming to be made in routine bacteriological investigations."

Will alfalfa feeding inoculate manure? (*Wisconsin Sta. Bul. 302* (*1919*), *pp. 45, 46*).—It has been found by E. B. Fred that in the passage of material containing large numbers of nodule-forming bacteria through the digestive tract these bacteria are destroyed.

Ammonification of manure in soil, J. W. Bright and H. J. Conn (*New York State Sta. Tech. Bul. 67* (*1919*), *pp. 45*).—This bulletin is divided into two parts.

Part I, by J. W. Bright, deals with the soil organisms which take part in the ammonification of manure, shows that *Pseudomonas fluorescens* and *P. caudatus* are especially active in manured soil, and reports the results of an investigation of their function in soil. The previous statement (E. S. R., 37, p. 516) that nonspore-forming bacteria are most active in manured soil was verified. Pure cultures of *P. fluorescens* and *P. caudatus* multiplied much more rapidly in sterilized manured soil than pure cultures of *Bacillus cereus* Frankland. When sterilized manured soil was inoculated with a mixture of these three organisms in pure culture, the two nonspore-formers immediately gained the ascendancy, *B. cereus* becoming so reduced in numbers as to be undetectable by the ordinary methods of study. In field soil to which there had been no addition of organic matter for several years, *P. fluorescens* and *P. caudatus* were rarely found, while *B. cereus* was a common organism. When this same soil was mixed with manure and potted, *P. fluorescens* and *P. caudatus* immediately multiplied rapidly, while but small numbers of *B. cereus* spores and no active forms of *B. cereus* could be found. All three of these organisms are vigorous ammonifiers when tested in pure culture. The activity of the nonspore-formers and the absence of activity of the spore-formers in unsterilized manured soils leads to the conclusion that *P. fluorescens* and *P. candatus* are important ammonifiers of manure in soil, while there is no evidence that *B. cereus* takes part in this process.

Part II, which is a taxonomic study by H. J. Conn of these two organisms, describes them in detail as an aid to their identification by others. A bibliography is appended.

The collection, handling, and sale of city stable manure, W. H. Hamilton and J. B. R. Dickey (*N. J. Dept. Agr. Bul. 21* (*1919*), *pp. 36, figs. 20*).—The purpose of this bulletin is "to bring to the attention of farmers the importance of using care and discrimination in buying manure and to explain some of the practices in connection with gathering and marketing manure, especially those which have a bearing on its fertilizing value."

Preservation of liquid manure, R. K. KRISTENSEN (*Tidsskr. Planteavl, 26 (1919), No. 3, pp. 485–490*).—Laboratory experiments, conducted at the Askov Experiment Station, on the preservation of liquid manure by the addition of sulphuric acid and superphosphate are reported.

The liquid manure contained 0.478 per cent of nitrogen, of which 0.418 per cent was in the form of ammonia. After the addition of the preserving substances the liquid manure was vaporized in a water bath. It was found that two-thirds of the acid was combined with the ammonia, and the remainder with other bases. The addition of very small quantities of the acid had no effect on ammonia losses. It was further found that in order to bind all of the ammonia contained in 5 cc. of liquid manure, 1.3 gm. of superphosphate, containing 18 per cent phosphoric acid, was necessary.

[Report of soil fertility work in Massachusetts], E. F. GASKILL (*Massachusetts Sta. Rpt. 1918, pp. 13a–19a*).—Noting the progress of work previously mentioned (E. S. R., 41, p. 21), this report indicates that the nitrogen experiment with corn for the year gives results agreeing closely with those obtained in previous years. On the potash field the crop was soy beans, and as in previous years, it did not show any striking response to potash. On the phosphate field the better yields were obtained with potatoes on the plats receiving the quickly available phosphates. In the comparative tests of potassium sulphate and potassium chlorid, results with various crops agreed closely with those of previous years.

The experiments on the top-dressing of permanent meadow, begun in 1886 and noted in previous reports, are summarized. The greatest increase due to use of fertilizers during 1918 was obtained with slag and potash, while in previous years, particularly during the period from 1893 to 1915, inclusive, the greatest average yields per acre were obtained with barnyard manure.

In a comparison of yields of timothy and fescue mixtures the timothy mixture gave the better yield the first year after seeding; since then the fescue mixture has given the larger crop. At the present time there is very little timothy on either plat, it having been replaced very largely by blue grass. The fescue mixture would seem to be the better of the two for use on fields of this character, which are to be kept in grass a number of years.

An experience in crop production, W. H. JORDAN and G. W. CHURCHILL (*New York State Sta. Bul. 465 (1919), pp. 20*).—Seventeen years' rotation experiments with corn, oats, wheat, and grass are reported (1) to determine the relative production of crops with farm manure, complete commercial fertilizer, and acid phosphate, supplemented by a small application of sodium nitrate, (2) to compare farm manure with complete commercial fertilizer, (3) to determine the influence of clover as a factor in fertility, and (4) to determine the value of soil analysis as a means of measuring fertility.

The largest yield of crops, measured in terms of dry matter, was with farm manure, although this did not greatly exceed the production with complete commercial fertilizer. Both the farm manure and the complete commercial fertilizer produced approximately 56 per cent more dry matter than the plats receiving no fertilizer. The plats receiving phosphoric acid with partial nitrogen and no potash produced about 33 per cent more than the untreated plats. The production of dry matter with the farm manure and complete commercial fertilizer was in the proportion of 118.3 for the former to 113.9 for the latter. If, however, allowance is made for the difference in yield of hay due to the fact that timothy sod was maintained for only one year, and comparison is made of the cereal crops produced, the relation of farm manure to commercial fertilizer was as 91:90 with clover in the rotation, and with timothy in the rotation, as 84:89.

A comparison of the clover plats with the timothy plats showed that in the 17 years there were produced of all crops 29,800 lbs. more of dry matter on the clover plats than on the timothy plats. However, on the basis of the cereal crops the difference in favor of clover was 13,500 lbs. of dry matter. These results indicate considerable advantage from the use of clover. A study of the yield of dry matter on the plats receiving no fertilizer, one with clover in the rotation and the other with timothy, showed that production was maintained on these plats as effectively with timothy as with clover in the rotation. The yields following the first rotation were maintained without any essential drop.

A comparison of the analysis of the soils on the several plats before and after 17 years of cropping showed no differences or changes which gave either any indication of the effect of the unlike systems of treatment or of the unlike productivity of the plats at the end of the 17 years. A comparison of the results of the experiment on the basis of the cost of the fertilizers and the value of the crops showed that the cheapest increase of production was with acid phosphate combined with a minimum amount of nitrate of soda.

Fertilizers on sand (*Wisconsin Sta. Bul. 302* (*1919*), *p. 45*).—Experiments on sandy soils at Spooner with manure reinforced with varying amounts of acid and rock phosphate, and with potash showed good results with corn, with residual effects in the following year. Experiments with potatoes showed that plats receiving no manure but only clover clippings for organic matter produced almost as well as those with manure.

Fertility tests on Colby silt loams (*Wisconsin Sta. Bul. 302* (*1919*), *pp. 44, 45*).—In fertilizer experiments at the Marshfield substation with corn and oats, F. L. Musbach reports that on plats treated with acid phosphate the increased value of five years' produce over untreated plats was $11.14 per acre. Phosphate applied with corn continued to show residual effects for the entire 5-year period. Tests with ground limestone supplied with oats on new seeding showed consistent increases throughout the 5-year rotation, amounting to $17.02 per acre with an outlay for limestone of $4.40. No appreciable results were obtained in potash trials, especially with corn and oats. The yield of corn was increased with rock phosphate.

Fertilizer experiments with cereals and root crops, K. Iversen (*Tidsskr. Planteavl, 26* (*1919*), *No. 2, pp. 193–297*).—Experiments extending from 1901 to 1915, inclusive, with barley, oats, mangolds, and sugar beets on loam soil to determine the fertilizer requirements of the soil are reported in detail.

The best results were obtained with complete fertilization. It was found, however, that nitrogen was the most utilized and potash was next, while only comparatively a small part of the phosphate fertilizer applied was utilized by the different crops. Climatic conditions which generally increase the size of crops also favored the utilization of fertilizers in soils growing oats and barley which had not been treated with stable manure. The greatest excess crop of barley grain was obtained in cold, dry summers, and of oats in cold, wet summers. In each instance the excess crop of straw was greatest in cold, wet summers.

In using artificial fertilizers on mangolds and sugar beets in fields where stable manure was also used, the climatic conditions favorable to the size of the crop were usually unfavorable to the utilization of the artificial fertilizer. Hot summers, which favor the growth of heat loving roots, had an increasing effect on the decomposition of the manure, and there was less need for the nourishment contained in artificial fertilizers. The use of artificial fertilizers for mangolds and sugar beets gave on the whole a greater absolute surplus crop in cold, wet than in warm, dry summers. The percentage of surplus crop was found to be greater in both groups of experiments in years with unfavorable than with favorable conditions for growth.

In regard to the effects of the separate fertilizers, it was found that potassium fertilizers gave the best average results in warm, dry summers, and phosphates in cold, wet summers. This difference in the case of phosphates was much more apparent in experiments with root crops in which stable manure had been used than in the experiments with cereals. This relation indicates that the favorable effect of phosphates in cold, wet summers is not due to the direct effects of phosphoric acid as plant food, but is probably because easily dissolved compounds of phosphoric acid favor decomposition in the soil.

The results of these experiments, considered with reference to the relation between the productive capacity of the soil and the size of the excess crop using fertilizers, confirmed the Mitscherlich law of minimum.

Economic use of fertilizers in the soils of Uruguay, A. A. Arregui (*Rev. Inst. Nac. Agron. Montevideo, 2. ser., 1918, Nos. 1, pp. 75–102; 2, pp. 31–61*).—This report is in two parts.

Part I deals with the composition of the soils of Uruguay and reports analyses of 281 representative samples of the soils. These, taken as a whole, show that about 82 per cent of these soils are well supplied with nitrogen and 81 per cent are well supplied with potash, while only 12 per cent contain sufficient phosphoric acid and only 3 per cent contain sufficient lime.

Part II gives the results of an economic study of the phosphatic fertilizer resources of the country, including superphosphate, Thomas slag, guano, and materials of animal origin.

Organic fertilizers of animal origin and their use, L. Malpeaux (*Vie Agr. et Rurale, 9 (1919), No. 11, pp. 187–191*).—This article discusses a number of the organic nitrogenous and phosphatic fertilizers of animal origin, and gives information as to their proper use on French soils.

Quality and value of important types of peat material, A. P. Dachnowski (*U. S. Dept. Agr. Bul. 802 (1919), pp. 40*).—This bulletin discusses the present status of peat utilization in this and foreign countries, gives definitions and points of view in classifying peat materials, and makes a tentative classification of important types of peat materials based upon their botanical composition and physical and chemical characteristics.

A list of 27 references to literature bearing on the subject is included.

Nitrogen fixation furnaces, E. K. Scott (*Trans. Amer. Electrochem. Soc., 34 (1918), pp. 221–254, figs. 17*).—The various types of electric arc furnaces for fixing nitrogen are first reviewed and compared. The Kilburn Scott three-phase furnace is then described in detail, and a comparative discussion is entered into of various details such as the balance of the current phases, starting the furnace, size of furnace, radiation and cooling-water losses, electrodes, stabilizing the arc, power factor, reactance, air supply, air compressor, preheated air, effect of increasing oxygen in the gas, effect of increasing pressure, absorption of the products, cooling the gases, raising steam in boilers, and the theory of the reaction and its reversibility.

The influence of storage on the loss and transformation of nitrogen in lime nitrogen, D. Meyer and R. Gorkow (*Illus. Landw. Ztg., 39 (1919), No. 7–8, pp. 27, 28, fig. 1*).—Experiments on the loss and transformation of nitrogen of cyanamid during storage are reported, which led to the conclusion that dampness and temperature are the important factors to be considered in the storage of cyanamid, and that during warm weather cyanamid must be protected against dampness to prevent the formation of dicyandiamid. It is concluded, therefore, that cyanamid should be stored in dry, closed rooms with dry floors, and that the possibility of absorption of moisture or carbon dioxid from the air must be prevented as far as possible. If stored in bulk it should be covered with sacks and straw.

Experiments with mixtures of lime nitrogen and superphosphate, E. Haselhoff (*Fühling's Landw. Ztg., 66 (1917), No. 5–6, pp. 105–115*).—Experiments are reported which showed that mixing lime nitrogen with superphosphate resulted in the reversion of the soluble phosphoric acid to insoluble forms. They further led to the conclusion that the mixture of lime nitrogen and superphosphate is not so effective as a fertilizer as a mixture of ammonium sulphate and superphosphate, which is attributed partly to the reversion of the phosphoric acid. In view of these results the mixing of lime nitrogen with superphosphate is not to be recommended.

Ammonium phosphate, Gerlach (*Ztschr. Angew. Chem., 31 (1918), No. 37, Aufsatzt., pp. 91, 92; abs. in Chem. Abs., 13 (1919), No. 19, p. 2409*).—Studies on ammonium phosphate and ammonium superphosphate, which are the results of treating pure monocalcium phosphate and superphosphate respectively with gaseous ammonia, are reported.

It was found that when moisture is present the gypsum of the superphosphate becomes active, and insoluble calcium phosphate and ammonium sulphate are formed.

Three years' experiments comparing the relative fertilizing values of superphosphate and ammonium phosphate showed an average difference slightly in favor of the latter. A less favorable action of the ammonium phosphate was obtained only where lime was applied at the same time.

Pot experiments with rye, sugar beets, and potatoes, comparing ammonium phosphate and ammonium superphosphate, showed practically no difference.

Studies on methods of determining the amount of available phosphoric acid in ammonium phosphate showed that the use of neutral potassium oxalate gave the best results.

Progress of the potash industry in the years 1917 and 1918, H. Hof (*Chem. Ztg., 43 (1919), No. 47, pp. 201–203*).—This is a summary of the work of others relating to development in the technical, manufacturing, and agricultural uses of potash during the years 1917 and 1918, with particular reference to Germany.

Sources of American potash, R. O. E. Davis (*U. S. Dept. Agr., Dept. Circ. 61 (1919), pp. 7*).—This is a summary of the potash situation in the United States, in which the possibilities and future prospects of the different sources are discussed. The opinion is expressed that, "with the return of normal prices, the western producers will be handicapped by high freight rates to the eastern or fertilizer markets. The production of by-product potash, with the gradual solving of the technical details of the processes, therefore, may offer most hope for a steady development of a permanent American supply."

The action of potash by-products on soil and plants, O. Nolte (*Landw. Jahrb., 51 (1918), pp. 563–672; abs. in Chem. Zentbl., 1918, II, No. 3–4, pp. 141, 142; Wasser u. Abwasser, 13 (1919), No. 10, pp. 307, 308*).—This report shows that by-product potash first increased crop yield on rich soil and then decreased it, the injury being greater the more deficient the soil was in nutritive constituents. Heavy fertilization decreased the injury caused by by-product potash, but did not entirely remove it.

No hindrance to assimilation of nutritive constituents resulted, but in fact a small increase was noted, especially in the case of lime and phosphoric acid. It is considered probable that ash constituents of plants are generally increased, but a content of 1 per cent of magnesia in the dry matter of plants was not reached. The assimilation of sodium was decreased by potash waste liquors in spite of their high salt content, and in soil there was an active exchange of bases resulting in the formation of insoluble compounds of nutritive constituents.

The leaching out of the soil of nitrogen and phosphoric acid was apparently decreased by potash by-products, and poor soils accumulated potash. The reduction in lime content of the soil was the most important occurrence, while the magnesia remained in the soil. The injurious action of the potash by-products in the first two years is attributed mainly to the poisonous effect of a high concentration of magnesium chlorid. Potash by-products also reduced the water assimilating powers of plants. Raw potash salts gave results similar to the by-products in that the use of water by plants was decreased.

Additional information concerning lime, M. M. McCool (*Michigan Sta. Quart. Bul., 2 (1919), No. 2, pp. 95–97*).—It is stated that examination of large numbers of soil samples from widely different sections of Michigan led to the conclusion that few of the surface soils of this State, aside from those deposited in former lakes, contain calcium carbonate except in the form of rather large fragments. A summary of several experimental field projects on the use of lime on acid soils indicates that it is not unusual for the returns from the first crop of the soils limed to pay for the cost of application. Data on the effect of ground limestone and hydrated lime on the available elements of plant food in four different soils show that lime, when applied to these soils, was quite active in increasing the availability of calcium, sodium, magnesium, sulphur, and also phosphoric acid. It was found that the lime had little, if any, effect on the leaching of potash from soils.

Natural carbonates of calcium and magnesium in relation to the chemical composition, bacterial contents, and crop-producing power of two very acid soils, S. D. Conner and H. A. Noyes (*Jour. Agr. Research* [*U. S.*], *18 (1919), No. 3, pp. 119–125, pls. 2*).—In this article, a contribution from the Indiana Experiment Station, pot and laboratory experiments conducted at the station are reported on an acid silty clay soil very low in organic matter and an acid black peaty sand high in organic matter. The experiments were conducted under controlled moisture conditions with natural carbonates of high purity. Wheat, red clover, and blood turnip beets were grown in succession. After being cropped 10 months under optimum moisture conditions the soils were tested for soluble salts, nitrates, nitrification, carbon dioxid, acidity, and both aerobic and anaerobic bacteria.

Although both soils originally contained twice as much magnesium oxid as calcium oxid, still calcite dolomite, and magnesite produced, with one exception, good crop increases on both soils. The 6-ton application of magnesite on the black sand soil, with a ratio of 1 calcium oxid to 7.9 magnesium oxid, killed the crops. Good crop increases were obtained with carbonate applications which produced ratios of calcium oxid to magnesium oxid varying from 2:1 to 1:5.3 on the yellow clay soil and from 3.4:1 to 1:4 on the black sand.

Wheat, red clover, and beets responded differently toward calcium and magnesium carbonates. With the medium applications beets were benefited more by magnesium carbonate, while wheat and clover gave greater increases with calcium than with magnesium carbonate.

Magnesite in all instances increased the concentrations of soluble salts in the soils more than calcite. Carbon dioxid determinations showed that the carbonates were not entirely decomposed at the end of one year. The decomposition of the magnesite seems to have proceeded faster than that of the calcite. Magnesite produced more favorable conditions for nitrification than did calcite. Magnesite encouraged the multiplication of both aerobic and anaerobic bacteria on the yellow clay soil more than calcite did, but on the black sand soil the reverse was true. Calcite increased the bacterial content of the soil more than did magnesite.

Notes on the effect of calcium sulphate on soils, M. M. McCool (*Michigan Sta. Quart. Bul., 2 (1919), No. 2, pp. 97–99*).—Studies on the effect of the addition of calcium sulphate to silt loam, heavy sand, fine sandy loam, very fine sand, heavy silt loam, and silt loam soil well supplied with organic material, are reported.

It was found on analysis of the washings from the soils that the addition of the sulphate resulted in a decrease in the amount of soluble silica, except in two instances. Two of the soils that were washed the second time showed less phosphoric acid in solution than did the corresponding untreated soils. Three of the soils that were washed 15 days after the first period contained less soluble magnesium than the unwashed samples. One negative result was found in the case of sodium, two with iron, and three with aluminum. The effect of the sulphate on the rate of formation of potash was negligible the first period and slightly reduced it the second period.

A report on the retail prices of unmixed fertilizer material as of June 1, 1919, with comparative prices for May 1 (*U. S. Dept. Agr., Dept. Circ. 57 (1919), pp. 11*).—Continuing previous work (E. S. R., 42, p. 219), this is a report resulting from an inquiry made through the States Relations Service and State directors of extension of the county agents in all the Southern States and in the Northern States as far west as Iowa and Missouri on the retail, cash, delivered price per ton of sodium nitrate, ammonium sulphate, high and low grade cottonseed meal, high and low grade tankage, acid phosphate, potassium muriate, potassium sulphate, and Nebraska potash.

"The reports show that the potash salts are not generally available to farmers. Out of 761 reports received from county agents only 7 gave quotations for sulphate of potash, the prices ranging from $55 to $350 per ton. On muriate of potash 11 county agents gave quotations ranging from $70 to $600 per ton."

On so-called Nebraska potash 24 county agents reported prices ranging from $35 to $160 per ton, and 61 quotations on ammonium sulphate gave prices ranging from $38 to $150 per ton.

"On cottonseed meal, high-grade, 207 quotations were received, ranging from $35 to $78 per ton, and on low-grade 221 quotations from $40 to $80. On tankage, high-grade, 165 quotations were received, ranging from $25 to $150 per ton, and on low-grade 78 quotations from $27.50 to $130 per ton."

Tables are given showing the retail prices for sodium nitrate and 16 per cent acid phosphate by States and counties.

Fertilizer report, J. W. Kellogg (*Penn. Dept. Agr. Bul. 328 (1919), pp. 69*).—This bulletin contains the results of actual and guarantied analyses of 545 samples of fertilizers and fertilizing materials, representing 367 different brands collected for inspection in Pennsylvania from August 1 to December 31, 1918.

"The results of analysis show that of the total number of samples 108, or 19.8 per cent, failed to meet their guaranties, while the majority exceeded the claims made. . . . The potash content of the complete fertilizers remained low compared with those of prewar seasons, the highest guaranty being 2 per cent, and there were twice as many brands of nitrogen and phosphoric acid fertilizers received as of the complete class."

Texts of fertilizer laws of the State regulating the sale of fertilizers are also included.

AGRICULTURAL BOTANY.

Monohybrid mutations, H. DE VRIES (*Biol. Zentbl., 37 (1917), No. 3, pp. 139–148*).—Monohybrid mutations are defined as those whose principal character follows the Mendel formula for monohybrid unions in crossings either with the maternal form or with related forms. They are relatively simple as to their hereditary characters, comparing in this respect with nonmutating species. Among the monohybrid mutations of *Œnothera lamarckiana* the author places *Œ. nanella* and *Œ. rubrinervis*, although the latter possesses a series of secondary characters which do not conform to the Mendel formula. *Œ. lamarckiana gigas*, since its establishment in 1897, has produced in almost every generation, as a second mutation, dwarfs having 28 as their chromosome number. Crossings of these dwarfs with *gigas* follow closely Mendel's rule as stated previously (E. S. R., 35, p. 128).

The author has found in crossings of *Œ. suaveolens* with *Œ. lamarckiana nanella* complete agreement with the rule laid down for monohybrids, and he expects to be able to establish the fact that a unit character is here involved. Details and results of studies during and since 1913 are indicated.

As the result of such work, the author states that *Œ. lamarckiana nanella* in crossings with *Œ. suaveolens* follows the Mendel formula for monohybrids. The ratio 0.5 to 1 per cent in which it springs from the mother form (mutates) each year can not be regarded as a Mendelian splitting, nor is there sufficient ground for such a conception in regard to other mutations.

The relation between stature and chromosome number in Œnothera, T. J. STOMPS (*Biol. Centbl., 36 (1916), No. 4, pp. 129–160*).—The author, as the result of observations noted, expresses the view that the *gigas* mutation in Œnothera does not result from irregularity in chromosome distribution. The alteration in chromosome number is thought to be a consequence rather than a cause of mutation.

Studies of teratological phenomena in their relation to evolution and the problems of heredity.—II, The nature, causes, distribution, and inheritance of fasciation with special reference to its occurrence in Nicotiana, O. E. WHITE (*Ztschr. Induktive Abstam. u. Vererbungslehre, 16 (1916), No. 1–2, pp. 49–135, figs. 29*).—The present paper is the outcome of an extended series of studies (E. S. R., 30, p. 826) on the phenomena of fasciation in plants.

The first part consists largely of compiled data on occurrence and classification, with a review of related researches by de Vries. In the second part the author has described in some detail a series of hybridization experiments, in which a mutant variety of *N. tabacum* breeding true as to fasciation was crossed with several distinct normal varieties of the same species and with strains belonging to markedly distinct species. The results of these studies so far as complete are presented in tabular form, and numerous conclusions are presented with discussion.

Studies on the cane variety, Phragmites communis pseudodonax, G. TISCHLER (*Ber. Deut. Bot. Gesell., 36 (1918), No. 9, pp. 549–558, pl. 1*).—This is an account of a study of the descendants of the giant grass *P. communis pseudodonax* as regards development, constitution, and heredity.

Alternation of generations in the plant kingdom, J. BUDER (*Ber. Deut. Bot. Gesell., 34 (1916), No. 8, pp. 559–576*).—This is an attempt to distinguish clearly and to symbolize the various alternating phases of plant life, also of animal life for purposes of comparison and completeness.

Annual periodicity in variegated plants, G. LAKON (*Ber. Deut. Bot. Gesell., 34 (1916), No. 8, pp. 639–648, figs. 3*).—In relation to studies on the annual periodicity of plants, as previously noted (E. S. R., 35, p. 632), the author has studied *Sambucus nigra* and *Acer negundo*, both of which presented cases of partial or total variegation associated with continuation of growth after normal plants or portions thereof had passed into the resting stage. Anatomical studies show a considerable deficiency of organic reserve materials in variegated plants.

The influence of light on the stature of plants, F. Schanz (*Ber. Deut. Bot. Gesell., 36 (1918), No. 9, pp. 619–632, figs. 7*).—This deals mainly with the effects of light of different wave-lengths when allowed to fall on plants during growth, in regard to such characters as stature and morphological differences, which are regarded as pointing to possibilities of a practical nature.

Phototaxis, F. Oltmanns (*Ztschr. Bot., 9 (1917), No. 5, pp. 257–338, figs. 17*).—Details are given of systematic studies on phototaxis, chiefly in lower plant forms, pursuant to those formerly noted (E. S. R., 9, p. 330).

Pigments of flowering plants, N. A. Wakeman (*Trans. Wis. Acad. Sci., Arts and Letters, 19 (1919), pt. 2, pp. 767–906*).—A brief discussion of studies and theories of flower color is followed by an extended account of work begun by the author as early as 1907.

It has been found that in the study of plant pigments each one should be considered not only in relation to the other colored substances in the same or related plants, but also to the colorless substances present. Close and peculiar relationship has sometimes been found to exist between the colored and the noncolored constituents in the species of a whole family. The work is given in considerable detail, with discussion of the bearings of the data obtained.

The microchemistry of plants: Serratulin, H. Molisch (*Ber. Deut. Bot. Gesell., 34 (1916), No. 8, pp. 554–559*).—The view that *Serratula tinctoria* contains even during life a yellow coloring material is claimed to be erroneous. It is suggested that the cells of the living plant contain a substance, serratulan (colorless or nearly so), which after the death of the plant yields under the influence of certain substances the intensive yellow body serratulin.

Bud symbiosis in Ardisia crispa, H. Miehe (*Ber. Deut. Bot. Gesell., 34 (1916), No. 8, pp. 576–580*).—It is claimed that certain bacteria which are normally present in parts of *A. crispa* maintain therewith a symbiotic relation. In the absence of the bacteria abnormalities of form and development are noted.

The irritable movements of plants, J. M. Macfarlane (*Univ. Penn., Univ. Lectures, 5 (1918), pp. 35–45*).—This is a lecture referring to a few outstanding facts of plant irritability.

Note on the effects of illuminating gas and its constituents in causing abscission of flowers in Nicotiana and Citrus, T. H. Goodspeed, J. M. McGee, and R. W. Hodgson (*Univ. Cal. Pubs. Bot., 5 (1918), No. 15, pp. 439–450*).—The authors present data considered as preliminary when collected as the result of a continuation of similar work by Kendall (E. S. R., 39, p. 226). Details are given of tests regarding the effects of illuminating gas in producing abscission phenomena in *Nicotiana tabacum*, *Citrus sinensis*, and *C. limonia*.

In *N. tabacum macrophylla purpurea*, illuminating gas at all concentrations caused flowers to fall in about half the normal period required for such fall. Of the constituents of the gas, carbon monoxid, carbon dioxid, and ethylene caused premature abscission.

All the experiments except two were carried out in a moist atmosphere. In these two cases observations were made of effects of dry atmospheres containing 10 per cent of illuminating gas and 5 per cent ethylene. In the illuminating gas, the first flower fell at approximately the same time as in case of the control. In tests with ethylene, the first flower fell almost as soon in the dry as in the moist atmosphere, and in both cases considerably earlier than in case of the control.

In case of *C. sinensis* (Washington navel), a marked abscission response to illuminating gas was shown irrespective of concentration. In illuminating gas, *C. sinensis* (Valencia) and *C. limonia* (Eureka) showed little or no increase in the reaction time of the abscission process.

Leaf cast, E. Küster (*Ber. Deut. Bot. Gesell., 34 (1916), No. 3, pp. 184–193*).—Observations and interpretations are given relating to a number of different plants as affected by external and internal conditions.

Soy bean cake as a substitute for peptone in the preparation of the nutrient media, S. Hori and U. Bokura (*Ann. Phytopath. Soc. Japan, 1 (1918), No. 1, pp. 27–31*).—After experiments with commercial material including ammonium sulphate, Kinako powder, and soy bean cake, it was found that the most satisfactory results were given by soy bean cake. Information is furnished regarding the preparation and expense of this medium.

A simple method of demonstrating the degree of opening stomata, F. Weber (*Ber. Deut. Bot. Gesell., 34 (1916), No. 3, pp. 174–183*).—This method is based upon the diffusion of a gas injurious to the plant, employing mainly ammonia and dealing chiefly with herbaceous plants and conifers.

Demonstration of liquid cohesion, A. Ursprung (*Ber. Deut. Bot. Gesell., 34 (1916), No. 8, pp. 475–488, pl. 1*).—The simple apparatus previously employed (E. S. R., 35, p. 432) for the demonstration of cohesion in liquids has been superseded by a method better suited to the purpose, and an account is given of its employment with Calamus and Clematis with resulting data and discussion.

The method of measuring [water movement in plants], A. Ursprung and G. Blum (*Ber. Deut. Bot. Gesell., 34 (1916), No. 8, pp. 525–539*).—Figures (with discussion), as derived from studies according to methods described, are given for cells regarded as distinct from the tissues (as such) in which they occur.

[A study of water movement in plants I], II, A. Ursprung and G. Blum (*Ber. Deut. Bot. Gesell., 34 (1916), No. 8, pp. 539–554; 36 (1918), No. 9, pp. 577–599, fig. 1*).—The first of these articles is a study of portions of *Fagus sylvatica* as regards movement of water and solutes in different portions of the plant under different conditions, according to methods above described. The second gives data in tabular form, with discussion, derived from a corresponding study of *Hedera helix*.

Studies on root saps, H. Kappen (*Landw. Vers. Sta., 91 (1918), No. 1–2, pp. 1–40*).—The author reports a study of legumes, grains, buckwheat, and mustard, grown in selected soil, with regard to the characters and constituents of the saps expressed from their roots. The results are tabulated with discussion.

The acidity of cell membranes, S. Odén (*Ber. Deut. Bot. Gesell., 34 (1916), No. 8, pp. 648–660*).—Results are tabulated of tests carried out regarding the acidity of coarsely pulverized material from different portions of various species of plants.

Negative pressure in transpiring shoots, M. Nordhausen (*Ber. Deut. Bot. Gesell., 34 (1916), No. 8, pp. 619–639, fig. 1*).—The author describes apparatus and the manipulation thereof by means of which, he claims, he was able to produce in connection with actively transpiring plants negative pressure exceeding two atmospheres.

Sugars in the leaves of the sugar beet plants, M. Potvliet (*Sugar [New York], 20 (1918), No. 9, pp. 358, 359*).—Summing up results of observations and analyses during several years, the author states that normal foliage is necessary to the full production of sugar by the beet plant. The leaf contains starch which is there transformed, principally into sugars, saccharose being confined principally to the lower ends of the stalks near the crown. Day and night samples contained practically identical sugars. Reducing sugars were practically confined exclusively to dextrose.

Migration of betain in plants, V. Staněk (*Ztschr. Zuckerindus. Böhmen, 40 (1916), No. 7, pp. 300–308*).—Further analyses (E. S. R., 27, p. 203; 31, p. 108), employing different plants, are said to have shown that the dry substance of young leaves contains more betain than does that of older leaves, and shows besides a higher percentage of total nitrogen. Ripening and death of the plant organs result in disappearance of betain along with that of other nitrogen compounds. The most probable decomposition product of betain, trimethylamin, was not found, probably because that product passed from the leaves at the close of vegetative activity. Betain is not regarded as a waste product. It is produced during germination of the seed. In beets betain appears for a short time in the leaves, passing to the roots. It is also stored in etiolated leaves.

A preliminary study of the influence of chlorids on the growth of certain agricultural plants, W. E. Tottingham (*Jour. Amer. Soc. Agron., 11 (1919), No. 1, pp. 1–32*).—The author has made a study of the effects of chlorids upon the growth and composition of plants, obtaining extremely variable results, due to the fact that the results are influenced by plant species, soil type, and particularly, climate. Evidence is cited which indicates that sodium chlorid serves directly as a fertilizer, chlorin being the active element. Further evidence indicates that chlorids may stimulate the biological production of available nitrogen compounds in the soil, though this effect seems inadequate to explain all the varied responses of higher plants to the application of chlorids. A tentative hypothesis is advanced to explain the varied physiological responses of plants to chlorids through regulation of enzym activity by these salts. It is thought possible that practical rules may be developed for the use of chlorids in agriculture in such ways as to increase and improve certain crops.

Relation between sulphuric acid and assimilation, A. Wieler (*Ber. Deut. Bot. Gesell., 34 (1916), No. 8, pp. 508–525*).—Details are given of studies along lines related to those followed by Wislicenus (E. S. R., 38, p. 629), regarding the influence of sulphuric acid on assimilative activity in plants, the examples taken being mainly forest trees.

The data presented are considered to show that assimilation occurs in leaves before their growth is complete, being considerable in young leaves, and that the stomata must be open in such young growing parts. Light is an active factor at this stage.

On the existence of a growth-inhibiting substance in the Chinese lemon, H. S. Reed and F. F. Halma (*Univ. Cal. Pubs. Agr. Sci., 4 (1919), No. 3, pp. 99–112, pls. 4*).—The authors have carried out with the Chinese lemon (*Citrus medica*) studies along lines related to those reported by Loeb (E. S. R., 40, p. 224) and by Appleman (E. S. R., 39, p. 536).

It is stated that shoots of the Chinese lemon which, while in a vertical position produce normally only a few shoots near the morphologically apical end (whether this be directed upward or downward), this being supposedly due to the dominant influence of such apical buds, may be made to develop lower buds by notching the phloem layers above these lower buds or by mechanically hindering the growth in such apical buds, as by inclosing them in a plaster cast. Horizontal branches or cuttings produce lateral shoots only from the dorsal or upper side.

The explanation suggested is that the shoots developing nearest the apex form a substance capable of inhibiting the growth of other buds on the vertical stem. This hypothetical substance appears to move toward the morphologically basal end of a vertical shoot or portion, to have a strongly hindering effect on growth, and to perpetuate a condition of dormancy in subapical buds. In horizontally placed shoots, this substance appears to settle to the lo the shoot.

Do mold spores contain enzyms? N. and L. KOPELOFF (*Jour. Ag* [*U. S.*], *18* (*1919*), *No. 4, pp. 195–209*).—A report is given of a study Louisiana Sugar Experiment Station to determine the invertase act spores of *Aspergillus sydowi*, *A. niger*, *A. flavus*, and *Penicillium e* determine whether they contain enzyms.

It was found that the spores of *A. niger* and *A. sydowi*, and to a l *P. expansum* and *A. flavus*, heated to 63° C. for 30 minutes in sugar sand caused a decrease in polarization and an increase in reducin a 10 per cent sterile sugar solution. An increase in the number of sp an increase in enzymic activity. It is considered demonstrated tha tion is due to the presence of an enzym in the spores, the enzym bein identical with invertase. The spores of the blue Aspergillus are tain a gum-forming enzym which paralleled invertase activity.

A lime-dissolving fungus, E. BACHMANN (*Ber. Deut. Bot. Gesell No. 8, pp. 581–591, pl. 1*).—*Pharcidia lichenum*, living saprophytica sitically on various lichens, is said to dissolve chalk.

Inventory of seeds and plants imported by the Office of Foreig Plant Introduction during the period from January 1 to March (*U. S. Dept. Agr., Bur. Plant Indus. Inventory No. 46* (*1919*), *pp. 9* Descriptions and economic notes are given of about 700 numbers o plants introduced during the period covered by the inventory.

FIELD CROPS.

[Work with field crops on the Belle Fourche reclamation periment farm in 1918], B. AUNE (*U. S. Dept. Agr., Dept. Circ pp. 9–16, 24, 25, fig. 1*).—In continuation of similar work previously R., 40, p. 331), this describes the progess of rotation experiments wi field crops, variety tests with small grains, and comparative tests sorghum, and sunflower for silage.

The average acre yields for all crops grown in the irrigated rota ments in 1918 were as follows: Alfalfa hay 3.27 tons, sugar beets corn 40 bu., winter wheat 21.7 bu., spring wheat 25 bu., oats 73 bu., bu., flax 17.7 bu., potatoes 164.3 bu., clover hay 1.28 tons, and clove

The maximum yield of oats, 92.6 bu. per acre, was obtained in tation of corn (sheeped), beets (tops sheeped), and oats, followe years of alfalfa, the third-year alfalfa being pastured with sheep. sults with potatoes have been secured in 2- and 3-year rotations w the highest yield, 236 bu., being obtained in a 2-year rotation with nured). The best yield of sugar beets was secured after potatoes rotation, and amounted to 14.78 tons per acre. The average sugar the beets for 1918 was 19.9 per cent and the average purity 88. The maximum wheat yield was 44.1 bu. per acre and was obtained a The best flax yield, 24.1 bu., followed beets in a 6-year rotation. corn yields were secured after alfalfa pastured with hogs or sheep.

In variety tests with winter wheat for the four-year period of inclusive, a Turkey selection (C. I. No. 3055–159) was first with acre and Kharkof (C. I. No. 1583) second with 32.6 bu. North Dak winter rye produced an average yield of 22.6 bu. and Swedish (M winter rye 23.5 bu. for the same period. Winter emmer and sp deemed sufficiently hardy for this region. Kubanka spring whea variety, produced on the average 24.5 bu. per acre for the 7-year period of 1912–1918, inclusive, while Marquis and Power, common varieties, produced 19.8 and 19.9 bu., respectively, for the six years, 1913–1918.

Midseason and late varieties of oats have given better results under irrigation than early varieties. For the varieties tested 7 years, 1912–1918, inclusive, Sixty Day has produced at the rate of 42 bu. per acre, Swedish Select and Canadian, midseason varieties, 46.5 and 47.8 bu., respectively, and White Russian, a late sort, 50 bu.

In variety tests with barley, Chevalier II, with an average yield of 39.8 bu. per acre for the period of 1914–1918, inclusive, gave the best results and is recommended for growing under irrigation in this region. Trebi, a 6-rowed variety, is also said to be a promising sort. White spring emmer was grown in comparison with barley and produced on the average 54.6 bu., although the yields in pounds of grain per acre were less than those of the better varieties of barley.

Damont (N. Dakota No. 1215) and Russian (N. Dakota No. 155) flax with 5-year average yields of 14.7 and 13.9 bu. per acre, respectively, have given the best results in flax variety tests.

Observations on alfalfa seed production were made during 1917 and 1918, in which the amount of seed produced by the first crop was compared with that produced by the second crop after the first had been cut for hay. In 1917 the first crop produced 4.61 bu. of seed per acre and the second crop 3.07 bu., while in 1918 the first crop produced 1.41 bu. and the second crop 0.13 bu.

Sweet fodder corn, Payne White Dent, and Marten White Dent with 2-year average yields of 8.62, 9.27, and 8.59 tons per acre are said to have produced by far the best silage although not the largest yield. Red Amber sorghum silage was found to be very sour and stock refused to eat it. Mammoth Russian sunflower with an average yield of 12.71 tons produced a very good quality of silage, which appeared to be relished by stock as much as good corn silage.

[Report of field crops work in Wisconsin, 1917 and 1918] (*Wisconsin Sta. Bul. 302* (*1919*), *pp. 24–35, figs. 6*).—This describes the continuation of work along the same general lines as previously noted (E. S. R., 36, p. 827).

The further development of the hemp industry in the State through the introduction of labor-saving machinery and cooperation between growers and millers is briefly outlined.

In breeding work for cold-resistance in corn, conducted by B. D. Leith, a strain of Golden Glow corn has been developed which is said to germinate when planted about 10 days earlier than the usual planting date. Plats of this strain were the only ones to reach full maturity at the station in 1917, while in 1918 it matured about one week earlier than the parent type. Promising results have also been secured with this strain in the northern part of the State. In limited trials a selection of Silver King has attained maturity from two to three weeks earlier than the parent strain.

Experiments in treating soft corn were conducted by H. W. Albertz in which lime was applied at the rate of 12 lbs. per 100 lbs. of corn, and common salt at the rates of 15 and 30 lbs. per 100 lbs. of corn. Untreated corn spoiled readily, while that treated with lime kept very poorly. The use of 15 lbs. of salt preserved the corn until May, although it deteriorated later, while the corn receiving the 30-lb. application was in good condition in July.

An improved strain of Marquis wheat developed by B. D. Leith has produced a six-year average yield of 35.9 bu. per acre. Based on results secured at the branch stations, it is stated that early seeding is essential for good yields, that excellent results may be secured by seeding wheat on corn or pea stubble without plowing if the seed bed is well prepared by disking and harrowing, and that winter wheat has been more profitable, on the average, than spring wheat. Drilling rather than broadcasting and heavy seeding (2 bu. per acre) are said to give the best results in resisting winter injury.

Germination tests made by A. L. Stone are held to indicate that the "close" thrashing of oats, whereby a portion of the surrounding hull is removed, markedly decreases the vitality of the grain.

A total of 225 varieties and strains of garden, field, and canning peas have been under observation at Ashland by E. J. Delwiche in an effort to develop sorts having early maturity, greater yielding ability, and improved quality. Among the canning peas two pure bred strains of Horsford are said to have exhibited fine quality and special adaptation to the heavy Superior red clay soil.

Studies of the winterkilling of alfalfa by L. F. Graber indicate that the two most successful ways of overcoming the difficulty include cutting the crop not later than the first week in September in order to permit a sufficient fall growth, and seeding hardy varieties such as Grimm, Baltic, Cossack, and Turkestan. Although the best hardy varieties produce variegated blossoms, it is stated that variation is not an indication of hardiness, as even common alfalfa will produce variegated flowers in seasons of deficient rainfall. The prevalent idea that alfalfa is eventually crowded out by blue grass is held to be erroneous, the appearance and spread of the blue grass being attributed entirely to the winterkilling of the alfalfa.

In experiments with Sudan grass made by G. B. Mortimer, the crop has given considerable promise as a hay crop, especially when grown with soy beans. Yields of forage have been secured ranging from 2.1 to 3.4 tons per acre, and of seed from 1,000 to 1,400 lbs. per acre. Broadcasted seed ripened earlier and more uniformly than that cultivated in rows.

Observations made on the effect of a resting period on germination, made by A. L. Stone, showed that the viability of wheat increased fully 60 per cent with two months' storage after harvest, while samples of timothy tested at frequent intervals for a period of 4 months showed an average increase of 36 per cent.

In pure-line selection work with soy beans for high and low percentage of oil and high and low iodin number as a measure of the relative value of the oils for use in paint manufacture, the results have failed to lead to the development of strains having consistently high and low oil percentages. In 1918, L. J. Cole found the average iodin number of 56 plants in the high-selection line to be 136.6 and that of 43 plants in the low-selection line 125.1, the first appearance of a distinct difference between the two lines. E. M. Nelson found that the amount and the iodin number of the oil in the leaves of soy bean plants was also subject to considerable variation, the amount of ether extract ranging from 3.7 to 6 per cent.

Observations on the amount of natural cross pollination occurring in soy beans and jimson weed are briefly noted. Of more than 6,500 soy bean pods examined from pure-line strains having distinctive characters and planted alternately in the same row, only three were found which showed evidence of crossing. Using stem color as a criterion in jimson weed, 1.2 per cent of the seedlings examined showed indications of crossing.

First generation crosses between standard Minnesota corn varieties, H. K. Hayes and P. J. Olson (*Minnesota Sta. Bul. 183 (1919), pp. 5-22, figs. 2*).—The authors report data for a four-year period on 12 first-generation crosses between standard varieties of corn grown in the State as compared with their parent strains, and conclude that "the use of first-generation crosses between pure varieties is a means of increasing yield in corn, although all such crosses are not equally productive, some being of no value."

Minnesota No. 13 was employed as the male parent and was crossed with Rustler, Silver King, and Chowen Yellow, dent varieties; King Phillip, Longfellow, Smut Nose, and Mercer, flint varieties; and Blue Soft, a flour corn. The crosses were made on an isolated plat with Minnesota No. 13 grown every other row. All varieties except Minnesota No. 13 were detasseled and seed from the detasseled stalks used to grow the first-generation crosses. Comparisons of the crosses and parents included observations on the relative yields, date of tasseling, date of maturity, percentage of shrinkage, height, shelling percentage, ear length, and number of rows per ear. Information was also secured on the relative yielding value of one- and two-year-old seed in an effort to determine whether results secured from two-year-old seed were reliable.

Well-matured, two-year-old seed gave better yields than one-year-old seed saved in a season when corn did not thoroughly mature, although equally good stands were obtained in both tests. Eleven of the twelve crosses exceeded the better yielding parent from 0.3 to 32.5 per cent, while one yielded 2.7 per cent less than the better parent. The increases in yield from first-generation crosses between eight-rowed flints and Minnesota No. 13 were considerable, the increase being sufficient to more than pay for the added cost of producing first-generation seed. In general the crosses were found to be intermediate for the other characters studied, although the average of the crosses exceeded the parental average and sometimes exceeded the better parent. As an exception to this, the row number in the flint×dent crosses was slightly less than the parental average. It is stated that greater increases in yield were obtained from crosses between dents and flints or flour corn than when both parents were dent varieties.

Briefly discussing the causes of increased vigor in first-generation crosses in relation to corn breeding, it is concluded that "in order to keep a variety in a vigorous condition it would seem that selection from vigorous stalks in perfect-stand hills would tend to keep up the heterozygous condition, providing no close selection to type of ear was practiced. There is no reason for supposing that in order to obtain the highest yields it is necessary to grow a variety in which the seeds and cobs differ in color, but it does seem very likely that a close selection for such characters as row number, ear length, and plant type will eventually produce so pure a variety that some factors for growth vigor will be eliminated."

Suggested improvements in methods of selling cotton by farmers, based on a comparison of cotton producers' and consumers' prices, O. J. McConnell (*U. S. Dept. Agr., Dept. Circ. 56* (*1919*), *pp. 8*).—This describes observations made by the U. S. Department of Agriculture in cooperation with the North Carolina Department of Agriculture and the North Carolina College on the prices received by producers as compared with those paid by consuming mills for the same grades and staples of cotton on the same day. More than 15,000 samples were secured from mills during the period of December 14, 1916, to May 1, 1918, and data obtained showing the date of purchase, the price paid, and the stipulated grade and staple. At the same time about 120,000 bales were classed for producers by county classers in the State, and information secured relative to the date and place of sale and the price received for a large part of the cotton.

The study indicated that the average cotton mill in North Carolina paid about $11.50 per bale more than North Carolina farmers received for the same class of cotton. Suggestions for improved methods of marketing the crop by farmers include the increased production of the kind of cotton the mills demand, the construction of a compress and of ample storage and shed space at some central point in the main producing area, the establishment of a disinterested classing service, provision for better ginning facilities, the shipment of less damaged cotton to the mills, and the growing of varieties having a superior staple.

Italian rye-grass (Lolium multiflorum), L. Carrier (*U. S. Dept. Agr., Dept. Circ. 44 (1919), pp. 2*).—The grass is briefly described and its adaptations, cultivation, and utilization noted.

Para grass (Panicum barbinode), S. M. Tracy (*U. S. Dept. Agr., Dept. Circ. 45 (1919), pp. 2*).—The adaptations, cultivation, and utilization of the grass are briefly noted.

Redtop (Agrostis alba), L. Carrier (*U. S. Dept. Agr., Dept. Circ. 43 (1919), pp. 2*).—The grass is briefly described and its adaptations, cultivation, and utilization noted.

Sudan grass (Andropogon sorghum) (*U. S. Dept. Agr., Dept. Circ. 50 (1919), pp. 4*).—This contains a brief description of the grass, with notes on its history, adaptations, cultivation, and utilization.

Relative productiveness and milling and bread-baking values of Ohio wheats, M. Corbould (*Mo. Bul. Ohio Sta., 4 (1919), No. 9, pp. 284–289, fig. 1*).—This report contains a classification under the headings of hard winter wheat, semihard winter wheat, and soft wheat of the varieties of winter wheat grown successfully at the station farm and considered suitable for growth in Ohio, together with a glossary of the same varieties arranged according to their quality as judged by the yield per acre, milling qualities, and baking qualities for bread, cake, and pastry. The list includes 19 varieties of semihard wheats which produce a flour of good quality suitable for all kinds of baking; 2 hard winter wheats which make good bread flour; 10 varieties of soft winter wheats the flour from which is unsuitable for bread making unless blended with considerable quantities of stronger flour, but is very good for other baking; and two varieties producing flour inferior for all purposes.

Many of the wheats highest in yield per acre, as shown by a 10-year average, were also among the first in baking strength.

Yellow-berry in hard winter wheat, H. F. Roberts (*Jour. Agr. Research [U. S.], 18 (1919), No. 3, pp. 155–169, figs. 2*).—In continuation of a previous publication (E. S. R., 20, p. 835), the author gives additional data on the yellow-berry of wheat, the study having been made at the Kansas Experiment Station. One hundred and sixty-four lots of wheat were investigated to determine the relation of yellow-berry to field conditions. Nearly half of these lots were pure strains or pure lines, while the others were checks or controls. The variation in yellow-berry percentages of the control rows was closely followed by the pure-line rows alternating with them.

The conclusion from the field tests is that the operation of common causes for the production of yellow-berry overshadowed any differences that may have been due to hereditary tendencies. With respect to the relation of yellow-berry to date of ripening, the experiment showed a higher percentage with the later dates of ripening. The effect of yellow-berry on kernel weight, starch production, etc., was studied, and the author found the yellow-berry kernels to be higher in moisture and starch content and lower in protein and ash than the hard, flinty kernels.

Seed tests made at the station during 1918, M. T. Munn (*New York State Sta. Bul. 462 (1919), pp. 135–156*).—Part 1 of this bulletin gives the results of analyses of 179 official samples of agricultural seeds collected during 1918, while part 2 comprises a brief discussion of voluntary examinations of both purity and germination of 863 samples of seed received from correspondents during the year. The testing of seed corn by the so-called rag-doll method is described.

HORTICULTURE.

The Yuma Mesa, A. E. VINSON, F. J. CRIDER, and G. E. THOMPSON (*Arizona Sta. Bul. 89 (1919), pp. 225–263, figs. 21*).—At the request of the U. S. Reclamation Service, the president of the University of Arizona appointed a commission to investigate and report upon the agricultural possibilities of the Yuma Mesa, with special reference to the production of citrus and other commercial fruit crops. The results of the investigation are here presented. Consideration is given to the topography, climate, and soil of the mesa, and to the character of existing fruit plantations, together with the commission's recommendations.

The commission concluded, in brief, that the Yuma Mesa is particularly well adapted to growing citrus of high quality, dates, olives, grapes, figs, and early truck. While ordinary field crops probably can not compete with similar crops grown in the valley, they can be produced in quantities sufficient for home needs. The irrigating waters of the Colorado River will, in large part, supply the fertilizing elements which prove so expensive in many citrus sections, and cover crops can be successfully grown. The commission therefore recommends that the Yuma Mesa be brought under irrigation according to the plan proposed by the engineers of the U. S. Reclamation Service and be developed by the growing of citrus and other subtropical fruits.

The club member's home vegetable garden, C. P. CLOSE (*U. S. Dept. Agr., Dept. Circ. 48 [1919], pp. 11, fig. 1*).—A contribution from the States Relations Service containing instructions for home vegetable gardening, specially prepared for use in boys' and girls' club work.

Diseases and insects of the home garden, W. W. GILBERT and C. H. POPENOE (*U. S. Dept. Agr., Dept. Circ. 35 [1919], pp. 31, figs. 46*).—A contribution from the States Relations Service discussing methods of treating and preventing insect pests and diseases of the more important garden vegetables.

Insecticides and fungicides, I. A. COLON (*Insular Expt. Sta., Dept. Agr. and Labor, Porto Rico, Bul. 20 (1919), Spanish Ed., pp. 23*).—A descriptive account of the more common insecticides and fungicides, including analytical data on insecticides and fungicides sold in Porto Rico.

Homemade, steam boiled, lime-sulphur wash, J. A. BERLY (*South Carolina Sta. Circ. 30 (1918), pp. 2, fig. 1*).—A steam boiling plant for making homemade lime-sulphur wash is described and illustrated, and directions are given for making both the steam-boiled and the fire-boiled wash.

Mushrooms, T. H. WHITE (*Maryland Sta. Bul. 232 (1919), pp. 67–85, figs. 2*).—The results are given of studies of several phases of mushroom growing that have been conducted at the station for a number of years by P. M. Novik, C. P. Close, and later by the author. Cultural directions for growing mushrooms are included and a brief list of references is given.

Differences in the yields of several varieties of mushrooms tested appeared to vary according to the condition under which they were grown. Eureka and Delaware, for example, gave the best results under cold and moist conditions, whereas Bohemia did the best under dry, warm conditions. Covering the beds with straw held the moisture more uniformly and resulted in a greatly increased production. A rich loam soil when used for covering or "casing" the beds after spawning gave better results than a poor, sandy, or clay soil.

Larger mushrooms and more in weight per square foot were produced in an unheated vault than in a heated shed, but production ceased in the vault temporarily when the outside weather became severely cold, whereas it continued throughout the winter in the heated shed. Production ceased one month earlier in the spring in the heated shed than in the unheated vault.

Manure from the horse barn produced nearly double the quantity of mushrooms as that from the cow barn. Loam mixed with the manure caused an increase in the yield and prolonged production. Loam also decreased the heat from fermentation when the beds were first made up. Manure from mules fed on molasses feed proved to be detrimental to mushroom production. When wheat bran and whole corn were fed with alfalfa hay the production of mushrooms was double that from beds made up with manure from teams that were fed the same grain ration with timothy hay.

Under cool conditions bottom heat may be effective in causing the spawn to grow and produce better, but if the mushroom house can be maintained at the right temperature bottom heat is unnecessary. After fermentation of the manure stops the temperature of the bed will fluctuate with that of the house, thus indicating the necessity of having the mushroom house properly warmed and insulated.

Insect enemies and diseases of the tomato, O. POWELL (*U. S. Dept. Agr., Dept. Circ. 40 (1919), pp. 18, figs. 23*).—A contribution from the States Relations Service discussing methods of controlling insects and diseases injurious to tomatoes.

[Report of horticultural investigations] (*Wisconsin Sta. Bul. 302 (1919), pp. 20–23, fig. 1*).—Results of a fertilizer experiment conducted for several years by R. H. Roberts and G. F. Potter on a bearing Early Richmond cherry orchard indicated the value of a nitrogenous fertilizer used either alone or in combination with phosphoric acid and potash. Plats receiving nitrogen showed an increase in yield, while trees to which only potash and phosphorus were added showed no gain over check plats. Nitrogen was applied in the form of 3 lbs. of dried blood and 1 lb. of sodium nitrate to each tree. The use of the nitrogenous fertilizer also seemed to produce a change in the fruiting habit of the tree. Trees receiving nitrogen carried a large proportion of their crop on 2- and 3-year-old spurs. Trees receiving no nitrogen produced their fruit almost entirely from lateral buds on 1-year-old wood with a consequent lack of spur development. It is pointed out that in order to keep the tree within bounds and low enough so as to make spraying and harvesting easier the increased seasonal growth resulting from applications of nitrogen must be controlled by judicious pruning.

Winter injury to cherry fruit buds is frequently sufficiently severe to materially reduce the crop. Roberts has noted that winter injury occurs most readily in buds which are most developed. Less injury was noted to basal and end buds than those in the central portion of the shoot. Blossom buds on short spurs show much less injury than those on long terminal growths. Generally no spurs are formed if the terminal growths are less than 6 in. long and most of the buds on a twig develop into spurs if the growth is over 12 in. long. In view of the greater cold resistance of blossom buds on spurs, the necessity of controlling the rate of growth of the tree largely through proper soil management becomes apparent. It is pointed out that pruning also plays an important part, as the length of the life of the spurs is prolonged by keeping the top of the tree open. As noted in a bulletin of the station (E. S. R., 40, p. 742), it has been found that much more satisfactory results can be secured where a definite system of rather heavy pruning is followed with sour cherry trees which are making sufficient growth to provide for maximum production.

Tests were conducted by Potter and Roberts to determine the relative rate of healing of pruning wounds when the cut was made so as to remove with the branch the so-called collar or enlargement at its base and when the cut was made at the outer edge of the collar. The relative rate of healing did not appear to be materially different in the two types of cuts. Hence it is concluded that the method of making the cuts at the outer edge of the collar is to be preferred, as the smaller exposed surface will heal sooner than when the cut is made closer to the supporting branch.

[Report of horticultural work on the Belle Fourche reclamation project experiment farm in 1918], B. Aune (*U. S. Dept. Agr., Dept. Circ. 60 (1919), pp. 32–34, fig. 1*).—A progress report on varieties of shade, ornamental, and windbreak trees that are being tested both on dry land and on irrigated land, including a list of fruit trees planted in the farm orchard during the three years, 1916–1918.

Fruit growing on the northern Great Plains, M. Pfaender (*U. S. Dept. Agr., Dept. Circ. 58 (1919), pp. 12, figs. 7*).—A contribution from the Bureau of Plant Industry, in which the author calls attention to certain problems of fruit culture in the northern Great Plains, outlines some of the experiments being undertaken for their solution at the Northern Great Plains Field Station at Mandan, N. Dak., and gives some of the more important results thus far secured relative to desirable varieties of orchard and small fruits, methods of propagation, planting, and culture.

Winter injury to fruit trees, G. S. Henry (*Rpt. Min. Agr. Ontario, 1918, pp. 20, 21*).—Careful study of the winter injuries to fruit trees during the winter of 1917–18, said to be the most severe in this respect on record, shows a loss of 20 to 25 per cent of fruit trees in Ontario. Many more appeared likely to die. Varieties hitherto considered as safe in regard to cold were seriously damaged. Several forms of injury and other causes are enumerated.

[Notes on the winterkilling of fruit trees during the winter of 1917–18], J. K. Shaw (*Massachusetts Sta. Rpt. 1918, pp. 45a, 46a*).—The author calls attention to some of the more important factors involved in winterkilling, as observed after the severe winter of 1917–18.

Trees located on low ground, without free outlet for cold air and with extensive hillsides or plateaus above offering conditions which favor the cooling of the air showed more damage than trees located where air drainage was good. Considerable injury was done to peach trees generally. Of the apples, Baldwin, Gravenstein, King, and Rhode Island Greening were among the varieties suffering most. Some of the varieties rarely injured were Oldenburg, Wealthy, McIntosh, Yellow Transparent, Northern Spy, and Ben Davis. Lack of vigor due to neglect, poor soil conditions, or the production of a heavy crop in the previous season rendered the tree more susceptible to injury. Young trees of excessive vigor, which had grown late in the fall and failed to ripen their wood, were badly damaged. In some cases young trees of comparatively hardy varieties suffered from root-killing, presumably because the root stock was less hardy than the top. Such injury was more common in the eastern part of the State, where there was little or no snow on the ground. For such locations, it is suggested that it may be worth while to plant 1-year-old trees and set them deep enough to root from the scion.

Nature and control of apple scald, C. Brooks, J. S. Cooley, and D. F. Fisher (*Jour. Agr. Research [U. S.], 18 (1919), No. 4, pp. 211–240, figs. 2*).—A contribution from the Bureau of Plant Industry, U. S. Department of Agriculture, in which the authors summarize their earlier work on the nature and control of apple scald (E. S. R., 40, p. 849) and give the results of more recent investigations on this subject. A list of cited literature is included.

The experiments as a whole show that the occurrence of apple scald is determined by orchard, packing house, transportation, and storage conditions. Mature fruit has, in general, scalded less than immature, but fruit in which the surfaces were just changing from green to yellow have scalded worse than those that were a leaf green and worse than those that had more completely changed to yellow. Well-colored red fruit surfaces have been practically immune to scald.

"Apples from trees receiving heavy irrigation have scalded worse than those from trees receiving light irrigation. This was found not to be due to the greater number of large apples in the former case, but to some forcing effect that increased the susceptibility to scald in both large and small apples. Delayed storage has increased or decreased apple scald, depending upon the amount of aeration the apples received during delay. Apples in ventilated barrels have developed less than one-third as much scald as those in commercial barrels when both were held in a storage room that received an occasional ventilation, but where the storage room received little or no ventilation the ventilated barrels caused but little decrease in scald.

"The amount of scald developed in cold-storage plants has varied greatly with the location in the room. Apples near the aisle or near a door have scalded far less than those in the bottom of the stack. Boxed apples exposed to a continuous air current of 0.88 mile per hour in a commercial storage plant have been practically free from scald, while similar apples that did not receive the constant fanning became badly scalded. Stirring of the storage air has been found more important than its renewal in the prevention of apple scald. The ordinary commercial apple wrappers have caused but little decrease in scald, and paraffin wrappers have been but slightly better, but wrappers impregnated with various fats and oils have either entirely prevented the disease or reduced it to a neglible quantity. In barrel experiments in which only part of the fruit was wrapped, scald has been greatly reduced on the apples adjacent to the wrapped ones as well as on the wrapped apples themselves.

"Typical scald has been artificially produced in a few days' time by exposing apples to the vapors of ethyl acetate, amyl acetate, or methyl butyrate. The manner in which scald can be produced artificially and the different methods of control indicate that the disease is due to the accumulation of esters or similar products of the apple in the tissues of the fruit and in the surrounding air. The vapors of these substances can be carried away by air currents or absorbed by fats and oils."

Twenty years of fertilizers in an apple orchard, U. P. HEDRICK and R. D. ANTHONY (*New York State Sta. Bul. 460 (1919), pp. 71–96, fig. 1*).—Bulletin 339 of the station gave the results for the first seven harvests in a fertilizer experiment which was begun in the station grounds in 1896 (E. S. R., 25, p. 643). The present bulletin discusses the results secured in eight additional harvests. The factors considered in interpreting results are yield and size of fruit and tree growth. Detailed tabular records are given for each tree included in the experiment. The results secured on each plat are summarized and discussed.

As measured by yields, acid phosphate at the rate of 340 lbs. per acre per year has been of no benefit when used alone. The addition of 196 lbs. of muriate of potash to the 340 lbs. of phosphoric acid apparently increased the yields, but the annual addition of 50 lbs. of readily available nitrogen to these amounts of phosphoric acid and potash has caused no increase in yield. Plats receiving stable manure have yielded no more than the check plats. There has been a tendency for the checks and phosphoric acid plats to take a slightly lower rank in yield as the experiment has continued. In general, the results are so contradictory that no conclusion of practical value can be drawn from the yields.

As measured by size of fruit, there is a greater difference between two near-by checks than between any fertilized plat and its nearest check. This, considered in connection with the variations among the duplicates of the fertilizer treatments, makes it impossible to draw any definite conclusion as to the effect of the treatments on size of fruit.

As measured by tree growth, the two phosphorus and potassium plats lead their adjoining plats, both in size of trunk and in tree volume, but it was impossible to conclude whether the increases were due to the potassium or the combination of the two elements, or to some tree or field variation which does not now show. Heavy applications of nitrogen in a complete fertilizer and in manure have not increased tree growth.

As measured by the costs of treatments, certain plats have given increases sufficient to equal the costs, or even to show a profit. Similar treatments in other plats have resulted in a loss.

Summing up the results of the experiment as a whole, the authors conclude that if the results continue in the present direction for another ten years, the increased yields may justify the recommendation of one or two of the treatments given; but at present this can not be done. Attention is called to the fact that these results are from a cultivated orchard on soil naturally well supplied with the plant feed elements. On thin, unfertilized, or in sod orchards the results might be quite different.

Dusting experiments in peach and apple orchards, F. D. FROMME and G. S. RALSTON (*Virginia Sta. Bul. 223 (1919), pp. 3–16, figs. 3*).—Results are given of experiments carried out during the season of 1919 to determine the efficiency of the dust form of application in the control of the common diseases and insects of Virginia apple and peach orchards, exclusive of those which are controlled by dormant applications. No particular effort was made to compare the economy of the dust and liquid applications.

The results of these experiments, supplemented by data from similar work applicable to Virginia conditions, led to the following conclusions:

"Dusting mixtures which contain sulphur and arsenate of lead, with or without the addition of a filler, have given satisfactory control of peach scab and [possibly] curculio, and may be used, if desired, for the first two summer applications. These materials, however, did not prove satisfactory in the control of brown rot, and therefore should not be relied on for the third or subsequent summer application.

"Dusting mixtures containing arsenate of lead as the insecticide have given satisfactory control of codling moth. Bordeaux dust gave especially satisfactory control of blotch and leaf spots in these experiments. Bordeaux dust and sulphur dust mixtures were practically worthless in the control of bitter rot in these experiments, and neither should be used for this purpose. No data on scab control were obtained in this work, but other investigations have shown the uncertainty of satisfactory control with such dusting materials as have been employed."

Peaches: Production estimates and important commercial districts and varieties, H. P. GOULD and F. ANDREWS (*U. S. Dept. Agr. Bul. 806 (1919), pp. 35, figs. 7*).—A joint contribution from the Bureau of Plant Industry and the Bureau of Crop Estimates. It discusses the relative importance and extent of the peach industry in the United States, presents statistical estimates of the annual production of peaches for the years 1900–1919, inclusive, and gives an account of important commercial districts and varieties by States.

The kaki or oriental persimmon, I. J. CONDIT (*California Sta. Bul. 316* (*1919*), *pp. 231–266, figs. 20*).—An account of the oriental persimmon (*Diospyros kaki*), with reference to the history of its culture in the United States, and particularly in California, botany, related species, irregularity in production of staminate flowers with certain varieties, effect of pollination on fruit characters of certain varieties, astringency in persimmon fruits, horticultural varieties, climatic and soil requirements, propagation and stocks, orchard management, harvesting, processing and drying, packing, marketing, cold storage, chemical analyses of fruits, and diseases and insect pests. A bibliography of persimmon literature is appended.

Commercial Dutch-bulb culture in the United States, D. GRIFFITHS and H. E. JUENEMANN (*U. S. Dept. Agr. Bul. 797* (*1919*), *pp. 50, figs. 32*).—The authors point out that in normal times the value of the bulbs used in the United States is not far from $2,000,000 a year, while those actually produced here are scarcely worth $25,000 in any one year. This is attributed to the rather commonly expressed opinion that it has been cheaper to buy imported stocks than to grow them. In view of the fact that this condition seems certain to change, the authors here present the available information on the subject of bulb culture, including a description of methods which have succeeded in this country and abroad. The following phases are discussed: Soil adaptation; temperature, soil and fertility requirements; number of bulbs grown per acre; planting; depth of planting; treatment after flowering; roguing; harvesting the flowers; cultivation; harvesting the bulbs; storing and curing; cleaning; sizing; advantages of sizing; culling; propagation; determination of flowering quality; packing bulbs; shipping bulbs; bulb growing for pleasure; miscellaneous bulbs; bulb pests; the best varieties to plant; varieties of narcissuses; varieties of tulips; and varieties of hyacinths.

A list of definitions pertaining to the bulb business is appended.

Distribution of tulip and narcissus bulbs in 1919, R. A. OAKLEY (*U. S. Dept. Agr., Dept. Circ. 65* (*1919*), *pp. 4, figs. 4*).—A popular circular issued with the tulip and narcissus bulbs sent out by the Office of Congressional Seed Distribution in 1919. It contains directions for planting and caring for the bulbs, methods of lifting and dividing bulbs, and naturalizing the narcissus. Varieties of Holland bulbs and narcissuses, included in the distribution, are described. Efforts to establish the bulb industry in this country by the Department of Agriculture and others are briefly noted.

Making and maintaining a lawn (*U. S. Dept. Agr., Dept. Circ. 49* (*1919*), *pp. 6*).—A contribution from the Bureau of Plant Industry containing practical instructions for making and maintaining a lawn.

Horticultural exhibitions and garden competitions, F. L. MULFORD (*U. S. Dept. Agr., Dept. Circ. 62* (*1919*), *pp. 38, figs. 13*).—A contribution from the Bureau of Plant Industry, in which the author discusses horticultural exhibits with reference to their organization, competitors, classification, various types of exhibitions and shows, arrangement and judging of exhibits, premiums, and rules. Lawn and garden competitions are also briefly discussed.

FORESTRY.

A policy of forestry for the Nation, H. S. GRAVES (*U. S. Dept. Agr., Off. Sec. Circ. 148* (*1919*), *pp. 11*).—This comprises the statement of a program of forestry for the Nation, prepared by the author and presented before a series of forestry conferences in different sections of the country during 1919.

The waning timber supplies, E. Secrest (*Mo. Bul. Ohio Sta., 4 (1919), No. 9, pp. 267–271*).—A discussion of the waning timber supplies in the United States, with special reference to the hardwood and timber situation in Ohio.

Forest devastation: A national danger and a plan to meet it, G. Pinchot et al. (*Jour. Forestry, 17 (1919), No. 8, pp. 911–945*).—This comprises the report of a committee appointed by the Society of American Foresters to recommend action for the prevention of forest devastation on privately owned timberlands in the United States. The committee first outlines the present situation as to the timber supply and forest devastation. A plan is then submitted for meeting the situation, together with suggestions on necessary legislation to carry out the plan.

Climate and forest fires in northern California, S. B. Show (*Jour. Forestry, 17 (1919), No. 8, pp. 965–979, pls. 2, figs. 5*).—A preliminary paper based on data obtained at the Feather River Experiment Station, Quincy, Cal., in 1915, 1916, and 1917, in connection with a study of the rate of spread of fires as controlled by physical factors.

The study shows that although litter is capable of holding its own weight of moisture, a layer of litter from 1 to 1.5 in. deep can, under normal conditions of summer weather, be reduced from the saturation point to air dry in from one to two days. Litter with over 8 per cent of moisture will not burn. During the fire season great fluctuations in moisture content occur on different exposures and at different elevations. The moisture content on a north slope may be above the danger point for three-fifths of the season as compared with one-third on a south slope during the same period. Clear weather in late fall may result in the rapid drying of litter, even at high elevations and after it has been saturated by over 1 in. of rain. Air-dry litter has the property of taking up moisture from the air, chiefly at night, to the extent of 5 to 6 per cent of its own weight. A study of factors influencing the dryness of litter, such as evaporation, wind movement, relative humidity, and temperature, shows that they all have the same seasonal and diurnal maximum and minimum.

The author finds that the rate of spread of fires is best measured by size of perimenter, rather than by linear distance traveled or by area covered. For slowly spreading fires, size of perimeter based on elapsed time is an arithmetical progression, while with more rapid spread it tends to become a geometrical progression. Rate of spread, as governed by wind velocity, may be stated to vary as the square of the velocity.

Airplane forest fire patrol in California, R. F. Hammatt (*Amer. Forestry, 25 (1919), No. 312, pp. 1531–1533, fig. 1*).—A popular review of the first season's activities of the airplane forest fire patrol service, inaugurated by the Forest Service of the U. S. Department of Agriculture in cooperation with the War Department on June 1, 1919, in California.

Three months' trial with airplane forest fire patrol has demonstrated an efficiency of about 85 per cent in the discovery of fires, with indications of a much higher efficiency with added experience. The effective discovery radius at an altitude of 5,000 ft. above the country patrolled is not less than 80 miles. The reporting of fires, however, is classed on the whole as unsatisfactory when compared with a system of lookouts and specially built telephone lines that have taken 12 years to install, develop, and perfect. "Without wireless, or some other method of greatly hastening the report time, the airplane can never function as efficiently as does our present-day lookout system."

No accurate data are available on the cost of the service.

Windbreaks, A. K. Chittenden (*Michigan Sta. Quart. Bul., 2 (1919), No. 2, pp. 88, 89*).—Suggestions on windbreak planting, including diameter and height measurements of 12 white pine, Norway spruce, Austrian pine, Carolina poplar, and Osage orange hedges that have been planted for periods ranging from 17 to 35 years. Jack pine, Scotch pine, and Austrian pine are specially recommended for windbreaks on sandy soil, as they have fairly compact root systems, will not sap the soil under adjacent fields, and make a rapid growth. White cedar, though slower growing than the above species, is specially adapted for wet or very moist soils.

National Forest areas, June 30, 1919 (*U. S. Dept. Agr., Forest Serv., 1919, pp.* 7).—A statistical report on National Forest areas, national monuments, national game preserves, and lands acquired in the White and Appalachian Mountains under the Weeks Act to June 30, 1919.

Outdoor life in the Colorado National Forest (*U. S. Dept. Agr., Dept. Circ. 34 (1919), pp. 19, pl. 1, figs. 7*).—An account of the recreational features of the Colorado National Forest, including much information of value to tourists and campers.

Vacation trips in the Holy Cross National Forest (*U. S. Dept. Agr., Dept. Circ. 29 (1919), pp. 15, pl. 1, figs. 5*).—An account similar to the above of the recreational attractions of the Holy Cross National Forest in Colorado.

Mountain playgrounds of the Pike National Forest (*U. S. Dept. Agr., Dept. Circ. 41 (1919), pp. 17, pl. 1, figs. 6*).—An account similar to the above of the recreational attractions of the Pike National Forest in Colorado.

The vertical growth of trees, R. H. CAMBAGE (*Jour. and Proc. Roy. Soc. N. S. Wales, 52 (1918), pp. 377–384*).—Measurements for a number of years were made on trees of several species to determine whether the trunk of a tree continues to lengthen among or below the branches while it increases in girth, or whether the increase in height is wholly due to the growth at the tree top.

Although conclusive proof is still wanting, especially in regard to tall-growing trees, the data thus far secured tend to show that although both the boles and branches increase in diameter as the young trees grow there is practically no extension in length of stem among or below the branches, at least during the first few years.

Botanical identifications of British Guiana trees and plants, L. S. HOHENKERK (*Jour. Bd. Agr. Brit. Guiana, 11 (1918), Nos. 3, pp. 98–106; 4, pp. 178–185*).—A list is given of trees and plants of British Guiana which have been botanically identified at Kew from specimens collected by C. W. Anderson in 1914.

The mountain trees of southern California, E. C. JAEGER (*Pasadena, Cal.: Pasadena Star-News Pub. Co.* [*1919*], *pp. 105, pl. 1, figs. 55*).—A guidebook for tree lovers, containing popular descriptions of trees in southern California occurring at an elevation above 3,500 ft. Shrubs or woody plants less than 15 ft. high are not included.

Notes on Eucalyptus, VI, J. H. MAIDEN (*Jour. and Proc. Roy. Soc. N. S. Wales, 52 (1918), pp. 486–519*).—In continuation of previous papers (E. S. R., 41, p. 744), supplementary notes are given on several species of Eucalyptus, and two new species are described.

Two new species of Eucalyptus, R. H. CAMBAGE (*Jour. and Proc. Roy. Soc. N. S. Wales, 52 (1918), pp. 453–460, pls. 3*).—***Eucalyptus pumila*** n. sp. and ***E. mitchelli*** n. sp., natives respectively of New South Wales and Victoria, are here described. An oil analysis of ***E. pumila***, made at the Technological Museum of New South Wales in 1907, is also given.

On the technology and anatomy of some silky oak timbers, R. T. BAKER (*Jour. and Proc. Roy. Soc. N. S. Wales, 52 (1918), pp. 362–376, pls. 13*).—This paper reports investigation on the timbers of the silky oak (***Grevillea robusta***), red silky oak (*G. hilliana*), satin silky oak (*Embothrium wickhami*), bull silky oak (*Cardwellia sublimis*), and pink silky oak (*Orites excelsa*). Data on the various timbers showing color, order of hardness, weight per cubic foot, breaking weights on standard size, salient macroscopical and microscopical features, and the character of the bark are summarized in tabular form.

Slash pine growth in the South, W. R. MATTOON (*Amer. Forestry, 25 (1919), No. 312, pp. 1547–1550, figs. 5*).—The author calls attention to the commercial importance of the slash pine (*Pinus caribea*), and the opportunity to utilize profitably hundreds of thousands of acres of sandy, "barren" lands by handling them for turpentine and pine timber products from second-growth slash pine stands.

Handbook of the technique of the softwood industry (spruce and fir), J. ABELES (*Handbuch der Technik des Weichholzhandels (Fichte und Tanne). Berlin: Paul Parey, 1918, pp. X+330, figs. 68*).—A handbook for lumbermen, lumber dealers, silviculturists, and forest owners, with special reference to the sawmill industry and the production of dimension material.

Tight and slack cooperage stock production in 1918, F. H. SMITH and A. H. PIERSON (*U. S. Dept. Agr., Forest Serv. [1919], pp. 15*).—A statistical report on tight and slack cooperage in 1918, prepared by the Forest Service in cooperation with the Associated Cooperage Industries of America.

DISEASES OF PLANTS.

Report of the [Maryland] State [plant] pathologist, C. E. TEMPLE (*Rpt. Md. Agr. Soc., 2 (1917), pp. 161–169*).—The unusually wet spring and summer favored the spread of plant diseases, and resulted in important losses. Accounts are given of Fusarium wilt and Septoria leaf blight of tomatoes, and also of spraying experiments.

[Report of the] department of botany, A. V. OSMUN (*Massachusetts Sta. Rpt. 1919, pp. 20a–26a*).—Brief accounts are given of the various lines of work carried on in this department during the year 1918, most of the investigations being on plant diseases and methods for their control.

The author states that the winter of 1918 was an especially severe one, followed by a cold spring and a drought which extended through the summer. As a result, a great many of the crops were seriously affected.

In connection with the disease investigations, an account is given of an attack on potatoes due to a fungus of the genus Phoma. This fungus produced typical stem lesions, and is thought to have been responsible for a considerable amount of damage to the potato crop. Studies made of the organism seem to indicate that while it is at least mildly parasitic under conditions of moisture, it will not prove serious under normal seasonal conditions.

Some notes are given on the occurrence of mosaic disease and leaf roll of potatoes, and the advantages of planting inspected and certified seed are pointed out. The author reports the occurrence in the State of "white pickle," a form of cucumber mosaic which occurred at several points, both out-of-doors and in greenhouses.

Notes on New York plant diseases, II, F. C. STEWART (*New York State Sta. Bul. 463 (1919), pp. 157–188, pls. 8*).—This is a second contribution on miscellaneous plant diseases, the first (Bulletin 328) having been previously noted (E. S. R., 24, p. 549).

In this bulletin the author describes various plant diseases in New York, among them a fruit rot of apples caused by *Leptosphæria coniothyrium;* the blackening of the roots and stems of apple and pear seedlings; the blackleg disease of cabbage caused by *Phoma lingam;* the decaying of cabbage leaves in storage, due to an unidentified fungus; a storage rot of carrots, due to *Sclerotinia libertiana,* which often has associated with it the soft rot caused by *Bacillus carotovorus;* a leaf spot, yellow leaf of cherries; the anthracnose, *Glœosporium caulivorum;* and leaf spot (*Pseudopeziza trifolii*) of red clover, a Rhizoctonia leaf rot of white clover and a Cercospora leaf blight of white alsike clover. Notes are also given on several diseases of the currant, including the relative importance of anthracnose and leaf spot, the attack of currant berries by *P. ribis;* a Botrytis leaf spot; an angular leaf spot; Fomes root rot; and a root rot caused by *Hypholoma perplexum.*

[Plant-disease investigations] (*Wisconsin Sta. Bul. 302 (1919), pp. 5–17, figs. 10*).—Summary accounts are given of investigations of plant diseases and their control, the experiments having been conducted in the departments of horticulture and plant pathology of the institution. Among the subjects treated are the relation of soil temperatures to plant root diseases; disease resistant strains of tobacco developed; cabbage yellows controlled through disease resistance; seed as a source of cabbage blackleg disease infection; the use of formaldehyde for the control of onion smut; the removal of rye ergot by brine baths; stripe disease of barley in Wisconsin; the effect of heating soil on plant growth; the spreading of grain stem rust by barberry; and the result of a plant disease survey.

Report of the mycologist, R. H. Bunting (*Govt. Gold Coast, Rpt. Agr. Dept., 1918, pp. 22–24*).—Cacao brown pod was increasingly prevalent throughout most of the cacao belt during the year, some correspondence appearing between prevalence of the disease and humidity.

White thread is also increasing in prevalence. It is not known whether *Marasmius scandens* is solely responsible for the disease. *Polyporus lignosus* remains the chief cause among the local cacao root diseases. The degree of prevalence of Para rubber root diseases is unchanged. Canker causes considerable apprehension. Peanuts were affected with the bunching disease and by *Cercospora personata.* Millet has been damaged by *Sclerospora graminicola.* Several parasitic fungi were identified, and new species are named as described.

Constitutional chlorosis, L. Savastano (*R. Staz. Sper. Agrumic. e Frutiic. Acireale, Bol. 36 (1919), pp. 3*).—Chlorosis in plants due to external causes according to groupings here indicated is distinguished from the form of chlorosis which is asserted to be constitutional, and which is discussed in this bulletin as to its nature, causation, and treatment.

[Scorching due to cuprammonium washes], O. Butler (*Prog. Agr. et Vitic. (Ed. l'Est-Centre), 39 (1918), No. 31, pp. 104–107*).—This is a condensed translation of a contribution previously noted (E. S. R., 38, p. 255).

A new case of symbiosis between a bacterium and a fungus, W. Bally (*Verhandl. Naturf. Gesell. Basel, 28 (1917), pp. 391–406, figs. 11*).—A fungus, described as a new species under the name of *Dendrostilbella macrospora,* is said to contain constantly a spore-forming bacterium which is thought to sustain a symbiotic relation with its host.

Notes on parasitic fungi in Wisconsin, IV–VI, J. J. Davis (*Trans. Wis. Acad. Sci., Arts, and Letters, 19 (1919), pt. 2, pp. 671–689, 690–704, 705–727, figs. 2*).—These three sections follow the general plan of preceding ones (E. S. R., 35, p. 844). An index is given of fungi referred to in the six sections noted.

A biological study of the Peronosporaceæ, R. Laubert (*Gartenflora, 66 (1917), No. 5–6, pp. 71–74*).—A partial study was made during April, 1916, in the neighborhood of Fort Rozan on the Narew, of Peronosporaceæ on a number of plants which are named.

Recent studies on Sclerotium rolfsii, J. J. Taubenhaus (*Jour. Agr. Research [U. S.], 18 (1919), No. 3, pp. 127–138, pls. 4, fig. 1*).—These studies were made at the Texas Experiment Station.

According to the author, *S. rolfsii* attacks a large variety of cultivated crops and is prevalent throughout the Southern States. It has also been reported in Illinois. The fungus is said to be a true parasite, found most frequently on light sandy loams. Air and moisture are both necessary for infection. If buried too deep in the soil the organism apparently dies, hence deep plowing is suggested as a control measure. No varietal or physiological strains have been found, but there appears to be strong indication of plus and minus strains of the organism.

The transmission of [plant] diseases through the seed, and compensation for losses so caused, F. K. Ravn (*Jahresber. Ver. Angew. Bot., 12 (1914), pp. 18–27*).—A study is outlined of infection percentages from smut and stripe disease on cereals, and suggestions are made regarding compensation for the resulting losses to planters.

A preliminary note on foot-rot of cereals in the Northwest, B. F. Dana (*Science, n. ser., 50 (1919), No. 1299, pp. 484, 485*).—A report is given of a foot-rot disease of cereals which was found in several counties of Washington during 1918, being particularly destructive to wheat but also occurring on oats and barley. A study of the fungus was made, and a mycelium was found that agreed fairly well with *Rhizoctonia solani* except in the diameter of the hyphæ. No fruiting stage of the fungus has been connected with the sterile stage on the base of the culms. The author believes that there is a close similarity between this disease as it occurs in Washington and that described as caused by *Ophiobolus graminis* in Australia. He also believes that it is identical with the disease reported by Cordley (E. S. R., 14, p. 367), as occurring in Oregon. This would indicate that the disease has been present in the Northwest for a considerable time.

The imperfect stage of Leptosphæria tritici of wheat, L. W. Durrell (*Science, n. ser., 50 (1919), No. 1289, pp. 252, 253*).—The author reports finding a species of Ascochyta in connection with studies of anthracnose of small grains, and while culturing *L. tritici* the relationship of the two forms was indicated. Single spore cultures of ascospores of *L. tritici* produced, on potato agar and on sterile straw, pycnidia and pycnospores like those found growing with the perithecia on the wheat plant.

Aged bean seed, a control for bacterial blight of beans, C. W. Rapp (*Science, n. ser., 50 (1919), No. 1303, p. 568*).—The author reports that in the investigation of bacterial blight on beans due to *Bacterium phaseoli* the most successful method of eliminating the disease has been the use of aged seed. Experimental plats were planted with seed two, three, four, and five years old. Seed four and five years old never produced blighted plants, but the percentage of germination was so low as to prohibit its use. Where two and three-year-old seed was used for planting on uninfected land and at a sufficient distance from other bean patches there was little or no disease, and the percentage of germination was sufficiently high to make the use of such seed practical under actual farming conditions.

Ascochyta pisi, G. Scalia (*Staz. Sper. Agr. Ital., 51 (1918), No. 3–6, pp. 228–242, pl. 1*).—An account is given with discussion of a disease causing spots on leaves, stems, and seeds of beans, the organism associated with which is said to show slight disagreements with *A. pisi* as found on peas.

Bacterium solanacearum in beans, E. F. Smith and L. McCulloch (*Science, n. ser., 50 (1919), No. 1288, p. 238*).—The authors report having received in June, 1919, badly diseased bush beans from Lynn Haven, Fla. The leaves were wilted and more or less brown, even the petioles being brown and wilted to their base. The roots were brown and the epidermis somewhat decayed in places, and the woody parts of the plants had dark stained vascular bundles. Examination showed the presence of bacteria and cultures were obtained having the characteristics of *B. solanacearum*.

Inoculation experiments were conducted on a number of different legumes, and it was found that Waxbush, Red Valentine, and Refugee beans were very susceptible. In addition good infections were secured in Lima beans, a brown speckled variety of Pinto bean, and the Great Northern, a white Navy bean. Inoculations of the organism into peas showed that while the infection proceeded more slowly, it was not without pathogenic properties, at least for some varieties. The organism was also found infectious to the soy bean and to cowpeas. This is the first time that the disease has been reported on beans, peas, soy beans, or cowpeas. Beans are said to be very susceptible only in the early stages of their growth.

Potato demonstrations [regarding diseases in Ontario], G. S. Henry (*Rpt. Min. Agr. Ontario, 1918, pp. 72–78*).—Tests conducted in each county of Old Ontario with seed potato varieties from Old Ontario, New Ontario, and New Brunswick are discussed, with tabulation of results as regards percentages of leaf roll and mosaic as related to reduction in yield by these diseases.

The former disease is the more widely distributed and the more destructive to yields. Seed from New Ontario appeared to give the largest yields. Further tests on this point are to be made.

Bacterial blight of soy bean, F. M. Coerper (*Jour. Agr. Research* [*U. S.*], *18* (*1919*), *No. 4, pp. 179–193, pls. 8, fig. 1*).—In continuation of a previous brief reference (E. S. R., 37, p. 842), the author describes bacterial blight of soy bean, which had been under investigation at the University of Wisconsin. The organism causing this disease has been isolated, its morphological and cultural characters are described, and a technical description is given of the organism, *Bacterium glycineum* n. sp.

The blight has been under observation for several years, and is considered the same as that reported from various parts of the United States. It is characterized by the appearance on the leaves of small, angular spots which are either isolated or confluent. In late stages, the diseased tissues become dry and drop out, giving the leaves a ragged appearance. Bacterial exudate occurs on the leaf spots but is not very evident except under favorable moisture conditions. Petiole, stem, and pod lesions accompany the disease on the leaves.

The bacterium is said to make its entrance into tissues without wounds. Its isolation has been accomplished repeatedly, and the disease is readily produced by inoculation. The best growth of the organism is said to occur between 24° and 26° C. The maximum is about 35°. The absolute minimum has not been determined. Slow growth develops at 2° C. The organism is said to be sensitive to desiccation, and there seems to be gradual loss in pathogenicity when grown in artificial culture. Certain variations in cultural behavior have been noted, and the author believes that possibly she has been dealing with forms of a slightly variable species.

Control measures have not been definitely worked out, but greatest promise appears in the development of disease resistant varieties.

Preliminary report on root rot in Hawaii, C. W. Carpenter (*Hawaii Sta. Press Bul. 54* (*1919*), *pp. 10, pls. 8*).—Observations and field and laboratory studies are said to have shown at least one active cause of the Lahaina disease of sugar cane. This particular form of disease is caused by a parasitic fungus of the *Pythium debaryanum* type. Apparently the same fungus or a closely related species is responsible for root rots of pineapple, taro, banana, and rice. The fungus was first secured in pure cultures from rice, and later from taro. The organism has had been isolated, and inoculation experiments show that it is capable of causing the root rots mentioned above. The fungus is considered as being identical with *P. debaryanum*.

The control of cane fungi (*Sugar* [*New York*], *21* (*1919*), *No. 1*, *pp. 22*, *23*).—Ordinary Bordeaux mixture of the 2:2:50 or 4:4:50 strength is said to destroy the spores of injurious cane-seed fungi and to prevent entrance of such fungi, but it does not destroy fungi in the interior of the seed without injuring the seed. What is considered as an improved form of Bordeaux mixture is made up of copper sulphate 14 lbs., lime 9 lbs., and water 100 gal.

New fruit fungi found on the Chicago market, H. E. TURLEY (*Science, n. ser.*, *50* (*1919*), *No. 1294*, *pp. 375*, *376*).—The author reports a new Botrytis on apples, Polyscytalum on grapefruit, and Fusarium on grapefruit, the material having been found in the markets in Chicago. The effect of the different fungi on the fruit is described, and results of inoculation experiments show that different organisms produce these diseases as claimed.

A case of cauliflory and its significance, G. LAKON (*Naturw. Ztschr. Forst u. Landw.*, *14* (*1916*), *No. 6*, *pp. 241–251*, *figs. 2*).—An account is given of observations on cauliflory in apple trees which normally produce fruit buds only from young wood. This phenomenon is thought to be due to maladjustment of some sort between abundant organic nutrient materials in the cortex and lively growth, assimilation, and transpiration in the crown of the tree. It is said to be more frequently met with in tropical climates.

Black knot of plums and cherries, L. CAESAR (*Canad. Hort.*, *42* (*1919*), *No. 12*, *pp. 281*, *282*, *fig. 1*).—Black knot is said to be found all over Ontario, occurring even on wild cherry, though controlled with comparative ease by removal of diseased portions and spraying with Bordeaux mixture at least three times each year according to directions as detailed.

Court-noué, F. PAULSEN (*Prog. Agr. et Vitic.* (*Ed. l'Est-Ceutre*), *39* (*1918*), *No. 46*, *pp. 462–466*).—An account is given of a test begun in 1912 by replanting areas affected with roncet, employing different grape varieties.

It appears that of the vines replanted soon after the removal of those affected with roncet, some, at least, developed the trouble after a time, but apparently not after a varying number of years in case of certain varieties. The results of certain observations suggest that the trouble may be spontaneous and due to a sort of auto-intoxication produced by secretions.

Attempts to free the soil from the tendency to produce court-noué by use of disinfectants were unsuccessful.

[**Tests with fungicides against Peronospora on grapevines**] (*Weinbau u. Weinhandel*, *35* (*1917*), *Nos. 18*, *pp. 107*, *108*; *19*, *pp. 113*, *114*).—Details are given in tabular form regarding the employment of Perocid and Bordola paste in comparative tests with standard Bordeaux mixture against Peronospora on grapevines in portions of Prussia, Bavaria, Hesse, Baden, and Alsace.

[**Casein in fungicidal sprays for grapevines**], VERMOREL and DANTONY (*Prog. Agr. et Vitic.* (*Ed. l'Est-Centre*), *40* (*1919*), *No. 41*, *pp. 351*, *352*).—Tests with ordinary Bordeaux mixture and with the same plus 50 gm. of casein per hectoliter showed that while a greater quantity of the former remained on the grapes, the latter showed much more continuity on the surface and on drying left the copper compound much more uniformly distributed, also more adherent and persistent. Casein is regarded as a very desirable addition to Bordeaux mixture, neutralizing to a great extent, moreover, the washing effect of rains on the copper compound.

Notes on tree pathology, L. Savastano (*Ann. R. Staz. Sper. Agrumic. e Fruttic. Acireale, 4 (1916–1918), pp. 187–208, pls. 6*).—This includes parts XLIV to LII of the notes comprising this series (E. S. R., 29, p. 552). A list of all these publications is also given.

Indigenous trees attacked by mistletoe in the Valley of Mexico, A. Roldan (*Mem. y Rev. Soc. Cient. "Antonio Alzate," 37 (1918), No. 1, pp. 17–21, pl. 1*).—The author names six species of trees attacked by *Phoradendron velutinum* and one attacked by *P. brachystachium*, with a discussion of the forms of attack and injury and modes of multiplication and dissemination of these fungi.

Memorandum concerning diseases of filao trees (Casuarina equisetifolia) in Mauritius, H. A. Tempany (*Mauritius: Dept. Agr., 1919, pp. 4*).—The presence of a disease affecting filao trees on the Pas Géométriques and elsewhere has attracted the attention of the department of agriculture for some years. It was reported as increasing rapidly in 1917. A plan for a general survey of filao plantations, laboratory investigations, and experiments on control measures was started in 1919.

The disease is supposed to be due to a fungus identified as *Trichosporium vesiculosum*, or possibly to this and another fungus. Dissemination is principally by means of mycelium in the soil. The disease is briefly described. One form is characterized by the formation of sooty spores, and this is termed for convenience, smut disease; in the other form, spore production is absent, and this is called for convenience, dry-rot. The disease is sporadic, and does not seem to be contagious in the strict sense, as inoculation tests have not succeeded. The dry-rot attacks old trees with reduction and etiolation of the foliage.

Hevea diseases due to Diplodia, F. Vincens (*Bul. Agr. Inst. Sci. Saigon* [*Cochin China*], *1 (1919), No. 11, pp. 321–329*).—This is a discussion of Diplodia and of identical, related or associated fungi connected with die-back and other diseases of Hevea (in Indo-China), roots of which may be attacked in case of old trees. Preventive and remedial measures are also discussed.

Winter injury or die-back of the walnut, L. D. Batchelor and H. S. Reed (*California Sta. Circ. 216 (1919), pp. 20, figs. 14*).—An account is given of studies made through several seasons on the so-called die-back or winter injury of the Persian walnut (*Juglans regia*). The injury is characterized by the sudden death of the tops of the trees, and is usually first noticeable during the early spring following the dormant period. Four types of injury are described—those due to early autumn frosts, winter drought, high water-table, and alkali soil. Suggestions are given for the control of injuries as far as any definite means are known.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Suggestions for field studies of mammalian life histories, W. P. Taylor (*U. S. Dept. Agr., Dept. Circ. 59 (1919), pp. 8*).—This is said to be the outgrowth of an unpublished memorandum to field workers, prepared in 1917, regarding the desirability of increased attention to the gathering of life-history material.

Directory of officials and organizations concerned with the protection of birds and game, 1919, G. A. Lawyer (*U. S. Dept. Agr., Dept. Circ. 63 (1919), pp. 18*).—This is the twentieth annual directory of officials and organizations concerned with the protection of birds and game in the United States, Canada, and Newfoundland, revised to August 1, 1919.

Our national elk herds, H. S. Graves and E. W. Nelson (*U. S. Dept. Agr., Dept. Circ. 51 (1919), pp. 34, figs. 20*).—A program for conserving the elk herds on National Forests about the Yellowstone National Park based on studies made by the Biological Survey and the Forest Service.

Notes on the natural history of the bushy-tailed wood rats of California, J. Dixon (*Univ. Cal. Pubs. Zool., 21 (1919), No. 3, pp. 49–74, pls. 3, figs. 3*).—A report of studies of two subspecies occurring in California, namely, *Neotoma cinerea cinerea*, known as the gray bushy-tailed wood rat, and *N. cinerea occidentalis*, known as the western bushy-tailed wood rat. They are said to be of little or no economic importance in California, since they are mostly dwellers in rough, mountainous country, far from human habitations.

[Rats and their relation to disease] (*Jour. Roy. Sanit. Inst., 40 (1919), No. 1, pp. 44–77*).—Several papers relating to the subject are presented, namely, The Zoology of Rats and Mice, with Special Reference to the Question of the Future Control of the Rat Population, by M. A. C. Hinton (pp. 44–52); The Fleas Found on Rats and Their Relation to Plague, by A. W. Bacot (pp. 53–60); The Rat as a Carrier of Diseases Transmissible to Man and to Other Lower Animals, by A. G. R. Foulerton (pp. 61–69); and The Rat Problem—Repressive Methods, by W. Hanna (pp. 70–77).

The crow (Corvus brachyrhynchos), C. E. Sanborn et al. (*Oklahoma Sta. Bul. 128 (1919), pp. 8*).—The loss occasioned by the crow in Oklahoma led to the study of this bird and the preparation of this preliminary bulletin. A discussion of the damage done by crows, their winter prevalence in Oklahoma, and the location of crow roosts in the State is followed by a brief discussion of their general habits. Studies thus far have shown that grain, peanuts, and pecans are the principal diet in the State during the fall and winter, when available, and at other times animal offal, weed seeds, and insects. From the data at hand is estimated that at least 10,000,000 crows were present in the State during the winter and consumed 1 bu. of grain daily per 1,000 crows, or $1,200,000 worth of grain during the winter.

Methods of poisoning the crow, based upon formulas given by Kalmback (E. S. R., 38, p. 856), and shooting the crow as a winter sport are discussed.

The status of the genus Asarcia Sharpe, H. C. Oberholser (*Proc. Biol. Soc. Wash., 32 (1919), p. 200*).

Notes on the names of Halobaena caerulea and Prion vittatus, H. C. Oberholser (*Proc. Biol. Soc. Wash., 32 (1919), p. 201*).

Pagophila eburnea v. P. alba, H. C. Oberholser (*Proc. Biol. Soc. Wash., 32 (1919), p. 199*).

A note on the eye of the black skimmer (Rynchops nigra), A. Wetmore (*Proc. Biol. Soc. Wash., 32 (1919), p. 195*).

The names of the subfamilies of Scolopacidæ, H. C. Oberholser (*Proc. Biol. Soc. Wash., 32 (1919), p. 200*).

The Federal plant quarantine act, C. L. Marlatt (*Mo. Bul. Dept. Agr. Cal., 8 (1919), No. 8, pp. 439–443*).

The probable cause of injury reported from the use of calcium and magnesium arsenates, A. J. Patten and P. O'Meara (*Michigan Sta. Quart. Bul., 2 (1919), No. 2, pp. 83, 84*).—Calcium arsenate is said to have been introduced into Michigan in 1917 as a substitute for lead arsenate, and during 1918 magnesium arsenate was also placed on the market. These materials were expected to possess advantages over lead arsenate in that they contain theoretically more arsenic oxid, and should be produced at a considerably lower cost.

The use of these materials led to many reports of foliage injury, and a series of spraying tests were conducted to determine the cause of the injury. In searching for an explanation, it was thought that carbon dioxid might be the cause, and in order to determine the effect upon the different commercial arsenates several samples of lead and calcium arsenate and one sample of magnesium were treated with water saturated with carbon dioxid. The mixture was then filtered and the arsenic oxid determined in 250 cc. of the filtrate.

It was found that the calcium and magnesium arsenates not only contained on the average more arsenic oxid than lead arsenate, but also that their solubility gave a higher total percentage. It is believed that the greater solubility of calcium and magnesium is the fundamental cause of foliage injury where these materials have been used in spraying apples, peaches, and other free fruits.

[Report of the] department of entomology, H. T. Fernald and A. I. Bourne (*Massachusetts Sta. Rpt. 1918, pp. 39a–43a*).—In continuation of control work with the onion maggot, tests were made of the value of traps for catching the adults. Six traps placed in an area of about one-fourth of an acre during the months of May and June captured 48,000 flies, of which 4,500 were those of the onion maggot. While it could not be determined whether the flies had been captured before their eggs had been deposited, the fact that the field was practically free from maggots was thought to indicate that such might be the case.

Although previous observations had led to the conclusion that no second brood of the codling moth is present in the State in more than a few scattered individuals, a brood of considerable size was noted during the season of 1918.

It was found that arsenite of lime can not be safely used under conditions usually present, and studies of arsenate of lime have been taken up. Tests made of a commercial product known as Nature's Plant Food show it to have no value as an insecticide, and that it compares with ground limestone and sifted road dust as a repellent. Several proprietary insecticides of unknown value were tested during the year, viz.: Kling Kill Insecticide, which proved to be a very slow poison and seriously injured the leaves; Sulpho-Napthol (now spelled Sylpho-Nathol), which in order to be of any value against plant lice must be used as strong as 1.5 oz. per gallon, at which strength burning of the leaves always occurred; and Plant Lice Killer, the oily nature of which made it difficult to prepare, was found, when properly mixed, to be a very effective material for use against aphids at the rate of 1:15 and 1:20 of water, practically all the insects being killed.

A series of parallel tests was conducted during the summer with homemade Bordeaux mixture, Pyrox, and Insecto to determine their value against potato pests, nicotin sulphate 40 per cent in 1:800 dilution being added during the potato-plant louse period of activity. The Insecto had rather poor suspension qualities as compared with the other two, remaining in suspension poorly and frequently clogging the nozzle. The best distribution was obtained with the homemade Bordeaux, but Pyrox was not far behind. The flea beetle was well controlled by all three, and nicotin sulphate combined without difficulty and was efficient against the plant lice.

Biennial report of the State entomologist, July 1, 1916, to June 30, 1918, W. E. Rumsey (*W. Va. Dept. Agr. Bien. Rpt., 3 (1917–18), pp. 43–56, figs. 5*).—This includes reports on orchard and nursery inspection and a brief account of the periodical cicada.

[Economic insects in Trinidad] (*Bul. Dept. Agr. Trinidad and Tobago, 18 [1919], No. 2, pp. 52–97, figs. 16*).—Several papers relating to insects in Trinidad are here presented, namely, The Relation of Root Fungus to Froghopper Blight of Sugar Cane in Trinidad, by C. B. Williams (pp. 52–56); Report on an Investigation of Froghopper Pest and Disease of Sugar Cane in Trinidad, by W. Nowell (pp. 57–69); Sugar Cane Varieties and Froghopper Blight in

Trinidad, by C. B. Williams (pp. 70–83); and Control of the Cacao Thrips [*Selenothrips rubrocinctus*] in Trinidad and Tobago, by F. W. Urich (pp. 84–97).

Economic zoology (*Ann. Rpt. Bd. Sci. Advice India, 1917–18, pp. 51–56*).—In the first part of this report (pp. 51–53) T. B. Fletcher summarizes the entomological work done at Pusa and in the Provinces and native States; and in the second part, on forest entomology (pp. 54–56), C. F. C. Beeson reports on the insects of sal, teak, chir, etc.

Insect pests of interest to Arizona cotton growers, A. W. MORRILL (*Arizona Sta. Bul. 87 (1918), pp. 173–205, pl. 1, figs. 30*).—This bulletin gives a brief account of the more important cotton pests which occur in or are liable to be introduced into Arizona. These include the cotton boll weevil, the cotton bollworm, the pink bollworm (*Pectinophora gossypiella*), the cotton leaf worm, the salt marsh caterpillar, the cotton leaf perforator (*Bucculatrix thurberiella*), cotton square daubers (*Lygus elisus hesperus* and *L. pratensis oblineatus*), the Southwestern cotton stainer (*Dysdercus albidiventris*), the brown cotton bug (*Euschistus impictiventris*), the differential grasshopper (*Melanoplus differentialis*), *Schistocera shoshone* and *S. vega*, the cotton aphis, the cotton thrips (*Thrip arizonensis*), the two-spotted red spider (*Tetranychus bimaculatus*), and two beetles which attack the seedlings (*Myochrous longulus* and *Blapstinus pimalis*).

The cotton leaf perforator molts once on the surface of the leaf in a thin, white, silken cocoon. Upon completing its development it spins a cocoon which is attached to the cotton stalk or other parts of the plant, where it transforms to a pupa and from which it later emerges as a grayish white moth.

The cotton square daubers have up to the present time been the most destructive of the insect enemies of cotton in Arizona. They were first observed as cotton pests in Arizona in 1914 when they caused injury in the Salt River Valley near Phoenix. During the year 1918, the average loss was estimated to have been between 3 and 5 per cent of the crop, or amounting to from $420,000 to $700,000. Their injury is caused by the adults during the month of August. Immature stages have never been found in abundance on cotton plants, alfalfa fields appearing to be the principal source of the adults. They feed inside the bracts of the cotton square, sucking the juices from the developing parts of the flower bud, which results in the shedding of the squares. As a control measure it is recommended that the cutting of alfalfa fields should be started on the sides and continued toward the center, which should be left temporarily as a trap, whereupon large numbers of the insects can be captured with a hopper dozer, such as is used for grasshoppers. In one instance where the daubers averaged 1 to 1 sq. ft., or about 43,000 per acre, more than 7,000 were captured on less than an acre in the course of 15 minutes. In addition to the square daubers, about 3,500 specimens of the alfalfa hopper (*Stictocephala festina*) and about 1,000 specimens of the differential grasshopper were captured at the same time by means of hopper dozers used after dark with two lanterns suspended over pans of oil and water. It is pointed out that the strip or patch of uncut alfalfa should be left undisturbed until the rest of the field has made considerable growth.

The Southwestern cotton stainer has been found in various parts of the Salt River Valley and at Sacaton. While not generally injurious throughout the Salt River Valley, in one locality during 1916 they were destructive on several farms, destroying from 50 to 75 per cent of the immature bolls. The brown cotton bug has caused noticeable damage to cotton in Arizona, its effect being similar to that produced by the cotton stainer. It is found in nearly all of the cotton fields in Arizona in considerable numbers, but no excessive damage has thus far been observed.

Insects attacking peanuts in Queensland, E. JARVIS (*Queensland Agr. Jour., 12 (1919), No. 4, pp. 200–204, fig. 1*).—Of the 11 forms here considered, a mealy bug (*Pseudococcus sentrifolii*) is the only one which occasions decided loss in the field. This mealy bug, which develops on the roots and underground portions of the vines at a depth of 1 to 4 in., is said to infest approximately 30 per cent of the crop.

Cockroach pests in Minnesota, with special reference to the German cockroach, V. R. HABER (*Minnesota Sta. Bul. 186 (1919), pp. 3–16, figs. 7*).—This is a popular account of the habits of the cockroach, with particular reference to *Blatella germanica*, *Blatta orientalis*, *Periplaneta americana*, and *P. australasiæ*. Methods of control are dealt with at some length.

New observations on the life history of the bedbug (Cimex lectularius), A. HASE (*Centbl. Bakt.* [etc.], *1. Abt., Orig., 83 (1919), No. 1, pp. 22–39, figs. 25; abs. in Rev. Appl. Ent., Ser. B, 7 (1919), No. 11, p. 173*).—The author records the deposition of 250 eggs by a female kept in captivity during her life, and finds that the duration of the nymphal period is shortened to 27 days by abundant food and an optimum temperature of about 85° F.

Steam as a bedbug eradicator (*Pub Health Rpts.* [*U. S.*], *34 (1919), No. 48, pp. 2713, 2714*).—This is a brief description of the manner in which bedbugs were eradicated from a large bunkhouse of 70 rooms by a lumber company in Oregon. About two hours were required to raise the temperature of the building to 160° F., at which it was held for three hours.

Field experiments in spraying for control of San José scale, 1919, W. S. BROCK and W. P. FLINT (*Illinois Sta. Circ. 239 (1919), pp. 4*).—This circular records the results of a single season's tests and comparisons, in which commercial lime-sulphur solution 33° B. 1:8; Scalecide 1:15; B. T. S. 14:50; Niagara soluble sulphur 12.5:50; Sherwin-Williams dry lime-sulphur 15:50; and Dow dry lime-sulphur 15:50 were used. While the data presented, as is pointed out by the authors, constitute no adequate basis for a recommendation of any of these compounds, Niagara soluble sulphur, Sherwin-Williams dry lime-sulphur, Dow dry lime-sulphur, and Scalecide gave excellent results.

Two leaf-hoppers injurious to apple nursery stock, A. J. ACKERMAN (*U. S. Dept. Agr. Bul. 805 (1919), pp. 35, pls. 5, figs. 2*).—This is a report of studies of *Empoasca mali* and *Empoa rosæ* conducted at West Chester, Pa., during the seasons 1915 and 1916 and supplemented by field observations in southeastern Pennsylvania and western Maryland.

Investigations made of the more injurious species, *E. mali*, are first reported upon (pp. 2–20). Its attack on nursery apple trees results in the leaves becoming undersized and curled, which causes a decided check to the growth of the new wood. Curling begins at the apex and extends toward the base of the leaves, the lower surface always being rolled in. The leaves become wrinkled, and the loss of sap causes the tips to gradually dry up and turn brown.

In the vicinity of West Chester, Pa., there are three broods during the season and three corresponding checks in the terminal growth. The first brood is the most abundant on apple and causes more injury than either of the two following. As a result of the continued checking of the growth, nursery apple trees often require an additional year's growth before they become of marketable size. Seedlings and the initial growth of buds and grafts are very seriously injured, but after the first year's growth the more vigorous varieties become partially immune to injury and succeed in maintaining a satisfactory growth, while slow-growing and tender-leaved varieties are at all times badly injured by the attack. Among the varieties most severely injured in Pennsylvania nurseries are the Red Astrachan, a particularly slow grower during the first two seasons, which ranks first, followed by Smith Cider, Starr, Early Harvest, Summer Rambo, Delaware Winter, Wagoner, Golden Russet, Early Ripe, Wealthy, and Alexander. Three other species (*Empoasca birdii*, *E. flavescens*, and *E. unicolor*) were found associated with *E. mali* on nursery apple trees at West Chester. The injury caused by *E. unicolor* in the vicinity of West Chester was negligible.

In southeastern Pennsylvania *E. mali* hibernates only in the adult stage. The eggs are laid singly in the sides of the mid-vein and occasionally in the smaller veins of the terminal leaves. The average length of incubation of the first brood eggs is one week. The feeding period of the first brood nymphs extends from May 30 to about July 15, varying from 15 to 22 days, with an average of 18.7 days. The second brood eggs hatch from the latter part of June to about August 1, the length of the incubation period being about one week, and the average length of the second nymphal period 15.8 days. The third brood eggs hatch from July 30 to about September 1, the incubation period being about 9 to 10 days and the average length of nymphal period 18.7 days. The winter is passed in the adult stage under rubbish in the nursery or more often under accumulations of leaves in adjoining woodlands.

E. rosæ, while primarily a pest of cultivated roses and apples, is a rather general feeder. The nymphs and adults confine their feeding entirely to the lower leaves of apple trees in the nursery. Their injury is caused by the sucking of the plant juices as indicated by a mottling of the leaves with yellowish or whitish spots at the points where the punctures were made. When the leaves become heavily infested they turn yellow, dry up, and drop to the ground prematurely. The foliage is never curled by this species, nor is the terminal growth checked as in the case of injury by *E. mali*. A second type of injury is produced by the egg punctures made by the females in the fall during the oviposition period. The eggs are deposited under the bark of young apple trees, several hundred eggs often being placed on a single twig. As compared with the more destructive *E. mali*, the injury produced by *E. rosæ* to apple nursery stock is of little importance.

E. rosæ is two-brooded at West Chester, and hibernates in the egg stage, the eggs being deposited singly, largely under the bark of apple trees and rose bushes. In the nursery these eggs hatch from May 1 to 15, or about a month earlier than those of *E. mali*. About one month is required for the development of the first brood nymphs. The incubation period of the second brood eggs is about 25 days, hatching commencing about July 20. The second brood nymphs require a period of 17 days for development. The winter eggs are deposited throughout the month of October. Parasites appear to play a more important rôle in reducing the numbers of *E. rosæ* than they do in reducing the more injurious *E. mali*. Larvæ of dryinid parasites are quite common on the adults of *E. rosæ*, but have rarely been found attacking *E. mali*. *Anagrus epos* and *A. armatus nigriventris*, parasites of the winter egg of *E. rosæ*, help considerably in checking the numbers of this species. No parasites have been reared from the eggs of *E. mali*.

The author found that a single application of 40 per cent nicotin sulphate at the rate of 1:5000, combined with soap, will so materially check an infestation by the leaf-hopper when applied against the first brood nymphs that injury caused later by those that escape will be of little consequence. The same treatment made three or four weeks earlier is effective against the rose leaf-hopper, though this species is seldom sufficiently injurious to justify a special application.

A list of 28 references to the literature is appended. Recent studies of one or both of these pests by Washburn in 1908 (E. S. R., 20, p. 1049), Webster in 1910 (E. S. R., 23, p. 255; 33, p. 352), Lathrop in 1918 (E. S. R., 38, p. 858), Childs in 1918 (E. S. R., 39, p. 61), Ball in 1919 (E. S. R., 41, p. 847), and others have been previously noted.

Control of green apple aphis in bearing orchards, H. E. Hodgkiss (*New York State Sta. Bul. 461 (1919), pp. 97–134, pls. 10*).—Accounts are first given of the occurrence of *Aphis mali* in bearing orchards in New York, its life history and appearance, seasonal activities, and activities during 1918, when it appeared in abundance in western New York and was specially destructive in Orleans County.

Two sprays were tested, namely, nicotin sulphate-soap (nicotin sulphate 40 per cent, 0.75 pt.; fish oil soap, 4 lbs.; and water to make 100 gal.); and nicotin sulphate-lime (lump lime, 60 lbs.; copper sulphate, 4 lbs.; nicotin sulphate 40 per cent, 0.75 pt.; and water to make 100 gal.).

"The delayed dormant spray, by protecting the trees from early infestations of the lice, diminishes the opportunities for serious reinfestations from late spring migrations of the insect. The nicotin sulphate-soap spray is a very satisfactory aphidicide on account of rapidity in killing, ease of application, and its spreading and adhesive properties. Nicotin sulphate and lime is especially advantageous on trees of medium size with large amounts of succulent growth because of its deterrent influences on the insects in addition to its immediate killing properties. In planning spraying operations against the green apple aphis, chief dependence should be placed on the nicotin sulphate-soap spray for trees of unusual height. With plantings of younger trees or those newly set, especially where succulent stems are likely to be seriously injured, an application of nicotin sulphate and lime will prove an efficient and satisfactory treatment."

The control work reported upon has led to the conclusion that, in regions where aphids are annually destructive or attacks are apprehended, reliance should be placed on the delayed dormant treatment with lime-sulphur and nicotin sulphate, and on a supplementary spraying during midsummer with nicotin sulphate and soap when the green aphis threatens to develop to destructive numbers on fruit clusters.

Recent studies of the biology of this species by Baker and Turner have been noted (E. S. R., 34, p. 754).

Controlling army worm outbreaks in Ohio, T. H. Parks (*Mo. Bul. Ohio Sta., 4 (1919), No. 9, pp. 272–275, figs. 3*).—This is a brief popular account of the army worm, the first serious outbreaks of which in Ohio since 1914 occurred in June, 1919. Its injury was first reported from Darke County, early in June, where 20 acres of rye had been badly damaged before its presence was discovered. Its infestation in Darke County extended over an area of about 1,200 acres. Severe injury was also done in Madison County, and lesser outbreaks occurred in Champaign, Hardin, and Preble Counties. The greatest damage was to rye, but wheat, corn, timothy, and blue grass were also attacked.

The pink bollworm, C. L. Marlatt (*Mo. Bul. Dept. Agr. Cal., 8 (1919), No. 8, pp. 478–485*).—A paper with the discussion following on the present status of the pink bollworm in the United States, read before the First Interstate Plant Quarantine Conference held at Riverside, Cal., on May 26 and 27, 1919.

South African bagworms: Their transformations, life history, and economic importance, I–II, C. B. Hardenberg (*Ann. Natal Mus., 3 (1917), No. 3, pp. 619–686, pls. 3, figs. 6; 4 (1919), No. 1, pp. 143–227, pl. 1, figs. 25*).—In part 1 of this work the author gives a general sketch of the life history of bagworms, a discussion of their systematic position, and a detailed account of the wattle bagworm (*Acanthopsyche junodi*). In part 2, 11 species are dealt with at length, namely *A. tristis*, *A. alba*, *Clania moddermanni*, *Manatha æthiops*, *M. subhyalina*, *Manatha* sp., *Semimanatha fumosa*, *Monda delicatissima*, *M. major*, *M. rogenhofferi*, and *M. heylaertsi*.

Note on the European corn borer (Pyrausta nubilalis) and its nearest American allies, with description of larvæ, pupæ, and one new species, C. Heinrich (*Jour. Agr. Research [U. S.], 18 (1919), No. 3, pp. 171–178, pls. 5*).—The resemblance of *P. nubilalis* and a native species here described as new under the name *P. ainsliei*—both in form and in the habits of the corn attacking larvæ—have led to the preparation of full descriptions of the larvæ, pupæ, and adults by the Bureau of Entomology of the U. S. Department of Agriculture.

P. ainsliei, which appears in collections and literature under the name *P. penitalis* of Grote feeds upon Polygonum, Ambrosia, Xanthium, Eupatorium, and corn. There are records of its occurrence at points extending from Massachusetts to Missouri.

P. penitalis, of which *P. nelumbialis* is a synonym, was originally described from moths reared from larvæ feeding in the seed receptacle of the western water lily (*Nelumbo lutea*), which is its true food plant.

"The three species are very intimately related. In superficial adult characters and in structure of the female genitalia, *P. ainsliei* is most readily distinguished. It lacks the sex scaling of the forewing which is such a prominent character in *P. nubilalis* and *P. penitalis*. On the other hand *P. ainsliei* and *P. nubilalis* are most alike in structure of the male genitalia and hardly separable in larvæ, while *P. penitalis* is readily distinguishable from the other two in both. The adult male of *P. nubilalis* is easily distinguished from all American species of Pyrausta by its dark, smoky, fuscous forewings and hindwings combined with the distinctly yellow color of the lighter areas."

A brief account by Mosher has been previously noted (E. S. R., 41, p. 665).

Some practical notes on the prevention of mosquito breeding, J. A. Delmege (*Jour. Trop. Med. and Hyg. [London], 22 (1919), No. 19, pp. 181–184, figs. 7*).—The notes here presented deal solely with methods for the prevention of mosquito breeding, and more especially with the practical details of such methods as carried out in Macedonia, chiefly during the summer of 1918.

Malaria in the rice field districts of California, J. C. Geiger (*Rice Jour. and South. Farmer, 22 (1919), No. 11, pp. 35, 36, 50, fig. 1*).—A report of investigations by the U. S. Public Health Service under way in the rice fields in the United States.

Further observations on the habits and parasites of common flies, G. S. Graham-Smith (*Parasitology, 11 (1919), No. 3–4, pp. 347–384, pls. 2, figs. 25*).—This is a report of observations at Cambridge, England, conducted in continuation of those previously noted (E. S. R., 36, p. 256).

It was found that Empusa disease occurs in several species of flies, *Calliphora erythrocephala*, *Lucilia caesar*, *Hydrotæa dentipes*, *Fannia canicularis*, *Anthomyia radicum*, *Sarcophaga carnaria*, *Musca corvina*, and *Scatophaga stercoraria* having been observed to be infected by it. Certain gamasid mites destroy both fly eggs and young larvæ, and certain species of beetles destroy large numbers of fly puparia. "Numerous parasites were obtained from naturally infected fly puparia. Most of these overwintered in the puparia. The parasites include numbers of the five most important families of Hymenoptera parasitica or Terebrantia, namely, the Cynipidæ, Proctotrypidæ, Ichneumonidæ, Chalcididæ, and Braconidæ. Infection with species belonging to the last two families is very common.

"In 1915 great numbers of *Melittobia acasta* emerged from naturally infected fly puparia. Experiments and observations on these parasites showed that they frequently parasitized puparia already infected with the braconid *Alysia manducator*. The males, which are blind, unable to fly, and relatively few in numbers, reach maturity before the females in the same puparia, and the stronger specimens destroy the weaker. The males never leave the puparia in which they emerge, but mate with the females before the latter escape from the puparia. Fertilized females lay large numbers of eggs from which a few males and numerous females develop, but virgin females only lay a few eggs from which males develop. If fertilized subsequently numerous eggs are deposited from which both males and females develop. These parasites oviposit in puparia, but never in larvæ.

"In 1916 and 1917, *Nasonia brevicornis* and *Dibrachys cavus* were the chalcids most commonly parasitizing fly puparia. The braconid *A. manducator* was bred very commonly each year from fly puparia collected in the autumn. In 1915, 61 per cent of the puparia were infected. In each year some of these parasites from the same batch of puparia emerged in the spring and some in the autumn. The cause of this has not been ascertained, but it has been shown that the imagines from eggs laid by a single female appear at different times, even though the parasitized fly larvæ are kept under identical conditions. These parasites attack large larvæ. Virgin females readily attack larvæ and lay numerous eggs from which males emerge. Only one parasite emerges from each infected puparium. *Aphaereta cephalotes*, a smaller braconid, was bred frequently. It attacks small fly larvæ. Several of the parasites emerge from each infected puparium."

The oviposition of Saperda populnea, F. Scheidter (*Naturw. Ztschr. Forst u. Landw., 15 (1917), No. 4–6, pp. 113–128, figs. 6*).—A report of studies of this borer in Germany, which includes a list of the parasites which attack *S. populnea* larvæ.

Biennial report of apiarist and assistant entomologist, June 30, 1918, C. A. Reese (*W. Va. Dept. Agr. Bien. Rpt., 3 (1917–18), pp. 57–67, figs. 6*).—This includes a report on brood diseases of bees, winter loss, etc.

The Texas foul brood law, F. B. Paddock (*Texas Sta. Control Circ. D (1919), pp. 3–11*).—The text of the Texas foul brood law approved March 27, 1914, is given, together with revised regulations issued by the State entomologist and a list of the county apiary inspectors.

Notes on certain genera of ichneumon flies, with descriptions of a new genus and four new species, R. A. Cushman (*Proc. U. S. Natl. Mus., 56 (1919), pp. 373–382, figs. 2*).—The genus Zagryphus is erected and four species described as new.

Report on a small collection of Indian parasitic Hymenoptera, A. B. Gahan (*Proc. U. S. Natl. Mus., 56 (1919), pp. 513–524*).

Additions to A List of Families and Subfamilies of Ichneumon Flies of the Superfamily Ichneumonoidea (Hymenoptera), H. L. Viereck (*Proc. Biol Soc. Wash., 32 (1919), p. 198*).—Additions to the previous lists (E. S. R., 41, p. 360) are given.

FOODS—HUMAN NUTRITION.

The fat situation in Germany before, during, and after the war, Thoms (*Hyg. Rundschau, 29 (1919), Nos. 16, pp. 583–588; 17, pp. 615–620*).—The prewar production and consumption of fats in Germany, the new sources utilized during the war, and possible means of increasing production as rapidly as possible are discussed briefly.

Changes in composition of the ingredients of bread during baking, H. Mohorčič (*Arch. Hyg., 86 (1917), No. 6–8, pp. 241–247*).—Analyses of the materials used in bread making and of the resulting bread are reported, from which the author concludes that the pentosans, starch, and proteins undergo hydrolysis to a certain extent, and that during the fermentation of the dough the increase in the amount of yeast is accompanied by the formation of fat in the newly formed cells.

The use of wood in the preparation of war bread, H. Mohorčič and W. Prausnitz (*Arch. Hyg., 86 (1917), No. 6–8, pp. 219–240*).—The authors report that although wood pulp can be incorporated into bread without materially altering the appearance and taste of the bread, an examination of the feces of subjects using it in place of ordinary bread indicated not only that the wood pulp is entirely indigestible, but also that it overstimulates the production of gastric and intestinal juices. The satisfaction of hunger by means of wood bread also results in greater loss in body weight.

Survey of literature on the chemistry and physics of milk and meat, Wedemann (*Ztschr. Fleisch u. Milchhyg., 29 (1919), Nos. 22, pp. 317–321; 23, pp. 333–336*).—This is a brief review of the more important chemical and physical investigations of milk and meat products published from July, 1914, to December, 1918. No literature references are included.

Good drinks made of milk (*U. S. Dept. Agr., Dept. Circ. 72 (1919), pp. 8*).—This circular gives directions for the preparation of buttermilk, yogurt or Bulgarian buttermilk, buttermilk lemonade, and kefir or koumiss.

The food value of the milk of the water buffalo, W. W. Cadbury (*Amer. Jour. Diseases Children, 19 (1920), No. 1, pp. 38–41*).—The author states that the milk of the carabao (*Bos babalis*) or water buffalo is being used in China with satisfactory results as a substitute for cow's milk, being wholesome and palatable when produced under sanitary conditions. The percentage composition of water buffalo milk, as determined by C. O. Levine from the analyses of milk from 30 different animals over a period of 18 months, is fat 12.6, protein 6.04, carbohydrate 3.7, ash 0.86, and water 76.8 per cent. Owing to the high percentage of fat the milk is usually diluted with an equal amount of water. In preparing milk formulas for infant feeding it is necessary only to dilute and add milk sugar. A table is given of such formulas for infants from birth to the thirteenth month.

A case of hypersensitiveness to cow's milk, E. A. Park (*Amer. Jour. Diseases Children, 19 (1920), No. 1, pp. 46–54*).—The report is given of a case of extreme hypersensitiveness of an infant to cow's milk which was finally cured by the administration by mouth of minute and slowly increasing quantities of the milk. The symptoms of the anaphylactic condition produced by the milk before desensitization had been accomplished were drowsiness, flushing of the face, and yawning, followed later by pallor, vomiting, and prostration. Cutaneous tests to demonstrate the hypersensitiveness to cow's milk were negative, but the single intradermal test given was positive.

Baking powder, J. Pritzker (*Schweiz. Apoth. Ztg., 57 (1919), Nos. 26, pp. 363–366; 27, pp. 380–385*).—This is a discussion of the kind and proportion of ingredients which can safely be used in the preparation of baking powders.

[Miscellaneous food and drug topics], E. F. Ladd and A. K. Johnson (*North Dakota Sta. Spec. Bul., 5 (1919), No. 14, pp. 329–344*).—This number reports an investigation by F. C. Himber of retail prices of beef and sugar in several North Dakota stores, a paper on Snuff and Snuff Substitutes abstracted on page 315 of this issue, and brief notes regarding lemon-pie filling and bad eggs.

Use and preparation of food (*Fed. Bd. Vocat. Ed. Bul. 35 (1919), pp. 270*).—This bulletin suggests a series of short unit courses in the use and preparation of food designed to serve as a basis for instruction in day, part-time, and evening classes in home economics, including the following: The preparation of some simple foods; fruits and vegetables; practical ways of using peas, beans, and nuts; milk, cheese, and eggs; fats; meat, fish, poultry, and game; batters and doughs; sugar and sweets; home preservation of food; food for the family; special modification of the diet; and the housekeeper and the food problem.

As a whole the bulletin shows the influence of the food work carried on during the war emergency situation, much of which is applicable to postwar conditions. In its introduction it notes especially the cooperation of the Food Administration and the U. S. Department of Agriculture.

The food calendar, N. B. Crigler (*Urbana, Ill.: Univ. Ill., 1919, pp. 31*).—A calendar with a page for every day in the month. Each page contains a list of common food materials arranged according to their uses to the body, with spaces for recording the foods served at each meal of the day. This feature of the calendar, which is the same on all of the pages, is intended to help the housekeeper to secure needed variety in the food served, to avoid unnecessarily great variety, and to choose wisely and economically among foods which have essentially the same uses in the diet. The right hand side of each page is occupied by helpful suggestions about food and diet. Tables of weights and measures, the general principles of combining foods, and directions for estimating food values and for comparing the amount of food used with the amount needed are given. This feature of the calendar is different on all the pages, beginning with the simpler considerations and leading up to the more complex.

Tested international recipes, M. B. Van Arsdale, D. Monroe, et al. (*Teachers Col. [Columbia Univ.] Rec., 19 (1918), No. 1, pp. 68–86*).—Sixty foreign recipes, gathered from the foreign women of New York City, are published here. The recipes were tested in the experimental working classes of Teachers College. They offer practical suggestions to the American housewife, as most of them are highly nutritious dishes combining food elements needed in a meal.

High standards of living at low cost by cooperative housekeeping, A. S. Matthews (*Teachers Col. [Columbia Univ.] Rec., 19 (1918), Nos. 1, pp. 57–67; 2, pp. 185–195*).—How eight students lived cooperatively, maintaining a high standard of living at a low cost, is reported here. The total expenditure for food by each girl for the 34 weeks, the school year, was $41.82. The itemized expenditure of one member of the group, showing how the group method saves money without reducing the standard of living, is given. Some typical budgets as a basis of comparison are appended.

The effect of the past year's events on dietetics, L. Graves (*Mod. Hosp., 12 (1919), No. 1, pp. 19, 20*).—Information is summarized regarding the dietitian's work in connection with the solution of war food problems.

The dietitian in social life, L. H. Gillett (*Mod. Hosp., 12 (1919), No. 1, pp. 63–66*).—In this discussion of undernourishment, which plays such a large part in foreign population, the author points out that the solution must come from the combined efforts of physician, social worker, children's clinic, and dietitian. Much information is summarized regarding work now being carried on with undernourished children.

Relation of field dietetics to social service, B. M. Joseph (*Mod. Hosp., 12 (1919), No. 1, pp. 66, 67*).—The author believes that best results are obtained when close cooperation is maintained, and suggests what the work of the field dietitian should be.

The management of the dietary department of the hospital, L. G. GRAVES (*Mod. Hosp., 11 (1918), No. 5, pp. 394–398*).—Suggestions relative to a greater sphere of usefulness for the hospital dietitian are given here. The duties that the trained dietitian should assume are discussed.

Maintenance ration.—Function of carbohydrates, F. MAIGNON (*Compt. Rend. Soc. Biol.* [*Paris*], *82* (*1919*), *No. 21, pp. 806–808*),—A reply to the criticism of Bierry previously noted (E. S. R., 41, p. 670).

[Nutrition problems], E. V. MCCOLLUM (*Milk Dealer, 9* (*1920*), *No. 4, pp. 18, 20, 22–24*).—In this lecture, given at the Milk Conference in Boston on October 24, 1919, the author interprets in the light of the recent advances in the study of human nutrition the characteristics of the people who subsist upon three common types of diet—the cereal-meat diet of arctic regions, the cereal-edible root-tuber-legume-green vegetable diet common in China, Japan, and the Tropics, and the cereal-tuber-meat diet prevalent in the poorer districts of the United States.

In conclusion the author states that the greatest thing that can be done to raise the standard of health in this country is to change the type of diet in most homes by decreasing the consumption of meat and increasing the consumption of milk and green vegetables.

The technique of avitaminosis experiments by sterilization, P. PORTIER and L. RANDOIN (*Compt. Rend. Soc. Biol.* [*Paris*], *82* (*1919*), *No. 24, pp. 990–992*).—To obtain a vitamin-free diet for experimental purposes the authors sterilize a complete food mixture by heating at 120° C. in a gauze bag suspended in an autoclave. The material extracted by the steam is collected in a receptacle placed below the bag, and after the sterilization is completed is mixed again with the solid material.

Edema observed in a monkey, A. HARDEN and S. S. ZILVA (*Lancet* [*London*], *1919, II, No. 18, pp. 780, 781*).—The authors report the appearance of severe edema in a monkey after 289 days on a diet consisting of from 250 to 300 gm. of boiled polished rice, 10 gm. of "Marmite" (a yeast preparation free from fat-soluble A), 2 gm. of salt mixture, and treated lemon juice equivalent to 4 cc. of the original juice. Two other monkeys which were kept on the same diet, modified after 198 days by the addition in one case of butter fat and in the other of olive oil, showed no signs of edema. The addition of butter fat did not stimulate growth but kept the animal alive, while the addition of olive oil did not prevent the animal from declining, but with no definite symptoms, death ensuing after 262 days.

It is pointed out that these observations can be considered only as of a preliminary character, and that "further experiments will have to be carried out in greater detail and on a larger number of animals before definite conclusions can be drawn as to the cause of phenomenon."

Upon the quantitative relationship between the antineuritic value of a diet and the onset of polyneuritis, H. H. GREEN (*Rpts. Dir. Vet. Research, Union So. Africa, 5–6* (*1918*), *pp. 777–812, fig. 1*).—The results of an extensive series of tests upon pigeons on diets varying in respect to their content in antineuritic vitamin are reported, and a provisional working formula relating three of the factors involved in dietetic deficiencies of this order is proposed and discussed.

From the data presented, the daily demand for vitamin is shown to be not absolute but to depend largely upon the extent of exogenous metabolism, from which it is concluded that the main function of this vitamin concerns the gross metabolism of food. No evidence was obtained to justify the view that vitamin consumption is related to carbohydrate metabolism more specifically than to that of fat and protein. The water-soluble vitamin is also thought to be required for structural purposes by the various cells of the tissues, but a much smaller proportion is required for this than for metabolizing the food itself. The term "vitamin index" is used to denote the ratio of vitamin absorbed in digestion to the energy value of the digested portion of the food. If the diet is deficient the vitamin required for metabolism is taken from the vitamin reserves in the tissues, and the period of onset of deficiency symptoms depends upon the rate of depletion of reserves. The formula proposed to express these facts is as follows:

$$S = \frac{C}{V-X} \times \frac{I}{K} \times \text{other factors.}$$

In this formula, S is the period elapsing before onset of deficiency symptoms, V the minimum proportion of vitamin in the diet necessary for health, X the proportion of available vitamin actually present in the diet, C the extent of vitamin reserve in the tissues, and K the quantity of food metabolized. The applications and limitations of this formula are discussed in full, and a table is given in which the probable values of X are determined for samp, rice, and maize meal.

In conclusion the author discusses certain phases of the vitamin question, including the absolute requirements and body reserve of vitamins, the vitamin index, the nature of polyneuritis, and the vitamin requirements for various classes of animals. If the demand for vitamin is really proportional to the gross energy metabolism, the absolute demands of the pigeon are estimated as less than 0.01 mg. per calorie and the body reserves at less than 4 mg. of vitamin. The vitamin requirements of man and pigeons are regarded as very similar and much higher than those of cattle.

The influence of feeding and of starvation on the development of polyneuritis gallinarum, C. Eijkman and C. J. C. van Hoogenhuyze (*K. Akad. Wetensch. Amsterdam, Verslag Wis en Natuurk. Afd., 24 (1915–16), pt. 2, pp. 1471–1484; also in* [*English Ed.*], *Proc. Sect. Sci., 18 (1916), pt. 2, pp. 1467–1480*).—The authors review and discuss the conclusions of various investigators concerning the etiology of polyneuritis gallinarum, and report experiments conducted to throw some light upon (1) the development of polyneuritis on a one-sided diet as compared with starvation, (2) the effect of different foods on the consumption of antineuritic substances, and (3) the cause of the emaciation which with a one-sided diet often precedes the outbreak of the disease.

It was found possible to produce polyneuritis by general deprivation of food, and to hasten the outbreak of the disease by drenching the system with water. This is thought to refute the theory that polyneuritis is caused by a poison in the diet or by a toxin originating from the food in the intestinal canal, and also the possibility that it may be caused by an endogenous poison.

The theory that vitamins play a more important part in the metabolism of carbohydrates than of other foodstuffs is thought to be refuted by the starvation experiments in which the store of carbohydrates was very soon exhausted, and by feeding experiments in which the disease was brought about as rapidly by the use of a one-sided diet over 90 per cent of which was protein in the form of aleuronat.

The experiments to determine whether the emaciation preceding the outbreak of polyneuritis on a one-sided diet is attributable to a deficiency of special substances or to an unfavorable ratio of protein, fat, and carbohydrate, while yielding rather inconclusive results, indicate that the latter is not the sole cause of the condition. Disturbances in the mechanism of the digestion and loss of appetite are considered important causative factors. That polyneuritis is not the result of inanition is shown by the fact that in some cases it may be preceded by an increase of body weight in spite of the one-sidedness of the diet.

The causation and treatment of rickets, E. PRITCHARD, M. D. OXON, and M. R. C. P. LOND (*Brit. Med. Jour., No. 3072 (1919), pp. 627–629*).—The authors propose and discuss the theory that all varieties of malnutrition in infants ultimately lead to a condition of acidosis and the bony changes characteristic of rickets.

A study of creatinuria in infants, J. L. GAMBLE and S. GOLDSCHMIDT (*Jour. Biol. Chem., 40 (1919), No. 1, pp. 199–225*).—Two papers are presented.

I. *Relation of creatinuria to acidosis. The elimination of ingested creatin and creatinin* (pp. 199–213).—In this paper the authors discuss the possible relation of creatinuria to acidosis from the literature on the subject and from data obtained by adding acid or base to the food of infants and determining the output of creatin. The constancy of the creatin output in the experiments reported and the interpretation of the results obtained by other investigators have led the authors to conclude that "variations in the acid-base value of normal diets can not possibly bear relation to creatinuria in man, for the reason that they are never of sufficient magnitude to disturb the normal acid-base equilibrium within the body. As regards the relation to creatin excretion of acidosis produced by abnormal diets, we do not find in the literature satisfactory evidence indicating acidosis per se as a factor concerned in causing or increasing creatinuria."

Experiments on the effect of ingested creatin upon the creatinuria of infants are also reported. The results indicate that "smaller absolute amounts of ingested creatin lead to urinary excretion of creatin in infants than is the case with male adults. Ingested creatin is more completely excreted by the infant than by the adult male, and although the comparison presents greater difficulties of demonstration, there is an indication that, per kilogram of body weight, smaller quantities of ingested creatin lead to excretion of creatin in infants than in adult males."

A single experiment on creatinin ingestion is reported in which, in a period of 2 days, 62 per cent of the ingested creatinin appeared in the urine.

II. *Relation of protein intake to urinary creatin* (pp. 215–225).—Two series of experiments are reported in this paper, one on the effect on creatin excretion in infants of different levels of protein intake obtained by giving milk or milk dilutions, and the other, the effect of varying the amounts of whey given. In the first experiment different levels of protein were obtained as in a similar investigation of Denis, Kramer, and Minot previously reported (E. S. R., 38, p. 569), except that for the low protein periods a dilution of 16 per cent cream was used. Substantially the same results were obtained, namely, a high creatin excretion on whole milk and a low excretion on diluted cream. There was also noted a similar change in the creatin excretion.

The results obtained in the second series of experiments indicate that the quantity of whey given is more directly related to the degree of creatinuria than is the total protein value of the food.

"On the assumption that performed creatin in milk modifications is in proportion to the quantity of whey present, our results suggest that the ingestion of creatin is probably a large factor in the creatinuria of infants fed on cow's milk. The desirability of a more definite knowledge of the creatin content of cow's milk is indicated."

Studies of blood regeneration, M. V. BUELL (*Jour. Biol. Chem., 40 (1919), No. 1, pp. 29–77, figs. 15*).—Two papers are presented.

I. *Effect of hemorrhage on alkaline reserve* (pp. 29–61).—In the experiments reported in both papers, hemorrhage was produced by tail bleeding in hyperimmunized pigs in the ordinary routine of obtaining blood for serum to be used in vaccination against hog cholera. It was found that by allowing the blood to flow directly from the artery into a paraffined vessel containing potassium oxalate and centrifuging after standing from 30 minutes to 2 hours the alkaline reserve values obtained by analysis of the plasma by the Van Slyke method bore a fairly definite relation to the alkaline reserve of the blood as it exists in the body.

When pigs were subjected to hemorrhages amounting to approximately 1.3 per cent of their body weight, the alkaline reserve of the blood was somewhat lowered during the first few hours after bleeding. Not only was there considerable variation in the reaction of different individuals, but also in the same individual a much greater drop in alkaline reserve resulted if the animal struggled than if it remained quiet.

To investigate the ability of an animal to make good the losses in alkaline reserve due to repeated severe hemorrhages on a poor and incomplete diet known to be acid-free, the diet of one animal was restricted to corn and water and the animal was bled seven times at intervals of five days. The alkaline reserve value of the first blood shed on any day was found to bear no relation to the number of times the animal had been bled previously or the amount of blood taken at previous bleedings. The total nitrogen fell immediately after the first hemorrhage but began to rise after the fourth bleeding, indicating a regeneration of blood proteins. The urea and nonprotein nitrogen rose after the fourth bleeding, indicating a regeneration of blood proteins. The urea and nonprotein nitrogen showed a tendency to increase after bleeding. The percentage of chlorids remained constant.

II. *Effect of hemorrhage on nitrogen metabolism* (pp. 63–77).—The data presented in the first paper are supplemented by a study of the effect of hemorrhage upon the blood and urine of two pigs. One of these, *A*, was on a diet of corn meal and water and the other, *B*, on a diet of starch and water, the latter for the purpose of studying the effect of hemorrhage on endogenous nitrogen metabolism.

The blood data confirm the data previously reported. The urinary analysis gave no definite indication of increased nitrogen execretion due to hemorrhage in the case of *A*, but a definite increase in the case of *B*, where the nitrogen excretion represented endogenous metabolism only. No significant effect upon uric acid, ammonia, or creatinin excretion was noted, but a definite increase in creatin and phosphate excretion resulted in both cases. The H-ion concentration of the urine was not definitely influenced by hemorrhage.

These observations are thought to support the theory that hemorrhages amounting to 6 cc. per pound of body weight are not necessarily accompanied by a severe grade of acidosis.

ANIMAL PRODUCTION.

Feeding values of certain feeding stuffs, G. S. Fraps (*Texas Sta. Bul. 245* (*1919*), *pp. 5–29*).—This publication presents the details of 22 digestion trials (numbered 83 to 104) with sheep in continuation of those given in Bulletin 203 (E. S. R., 37, p. 865) and reports likewise the proximate composition, the Fraps productive values (fat values), and the production coefficients (E. S. R., 35, p. 561) of the materials fed. The digestibility coefficients and productive values are given in the following table:

Productive values of feeding stuffs and percentages digested by sheep.

Serial numbers digestion experiments.	Feeding stuffs.	Coefficients of digestibility.					Productive values.
		Protein.	Ether extract.	Crude fiber.	Nitrogen-free extract.	Ash.	
104	Acorns, whole (oil, 7 per cent)	....	83.88	14.97	50.39	....	10.71
84	Alfalfa hay	70.83	28.15	49.74	72.68	38.71	8.72
88-92	.....do	64.37	38.96	47.73	62.57	49.51	8.16
93-97	.....do	70.93	26.14	43.71	70.72	39.55	7.88
98	Bear grass (*Yucca glauca*)	36.00	....	64.72	61.84	64.44	7.21
100	Beet pulp, dried	55.35	....	77.19	87.25	2.08	14.47
99	Corncobs, ground	....	....	51.36	57.07	....	7.30
95	Cotton burrs (no seed)	27.93	65.74	23.60	68.64	83.74	5.02
89	Cotton seed, cold pressed (seed heated; oil, 18 per cent)	55.98	97.47	32.09	54.88	39.33	15.57
101	Cottonseed feed (protein, 41.5; fiber, 12.5 per cent)	87.73	100.00	55.32	34.14	91.08	14.80
90	Peanut hulls (fiber, 57 per cent)	43.43	82.03	7.66	57.57	34.81	2.15
87	Peanut hay (no nuts)	67.04	51.82	57.17	77.06	22.06	11.02
96	Peanut meal (fiber, 5 per cent)	94.41	99.50	20.91	86.77	58.00	22.01
85-86	Prairie hay	27.83	49.18	46.20	44.26	16.77	5.19
94	Rice bran	74.79	92.74	4.20	74.06	26.94	16.60
91	Rice hulls (fiber, 40 per cent)	8.89	79.33	.40	30.80	24.49	1.98
83	Rhodes grass hay	46.62	52.59	69.98	64.32	34.36	9.00
102	Soap weed stem	4.14	....	32.81	70.41	....	5.85
103	Spanish moss	.54	15.61	51.86	77.29	24.32	9.06

Data as to the composition of additional samples of acorn kernels and acorn hulls are also recorded. It was found that the acorn kernels of 4 species belonging to the group with sweet acorns are low in fat (about 4 per cent) while those of 5 species of the group with bitter acorns are high (averaging about 20 per cent).

Noteworthy war-time feeding stuffs, [I]–III, M. Kling (*Landw. Jahrb. Bayern, 6 (1916), No. 11–12, pp. 483–513; 7 (1917), No. 9, pp. 693–717; 8 (1918), No. 6–7, pp. 411–437*).—The author discusses the feeding value and reports proximate analyses of a variety of materials used, sold, or suggested for use in Germany as feeding stuffs during the war. Many of the products were composed of straw and chaff or were proprietary mixtures of low nutritive value.

Among the more unusual feeds treated in Part I, are rhubarb leaves, ground seaweed (Fucus), dried asparagus tops, pea vine meal, heather leaf stalks, kohl-rabi waste, spoiled sugar beet seeds and parsley seeds, pods of jointed charlock (*Raphanus raphanistrum*), seed coats of the broad bean, beechnut oil cake, and walnut residue after oil extraction. Materials discussed in Part II include sunflower heads denuded of seeds, beechnut germs, dried cabbage leaves, sugar beet fodder, meal made from a reed (*Arundo phragmites*), seeds of *Chenopodium quinoa*, wild rose seeds, and cakes or meal made from rape seed, sunflower seed, hazel nuts, beechnuts, and linden seeds after oil extraction. Those in Part III include clover hay meal, seagrass (*Zosbera marina*) meal, dried turnips, kohl-rabi meal, dried rhizomes of couch grass, bracken rhizomes, soy beans, barley offals, hops refuse, charlock (*Brassica arvensis*) seed cake, sunflower seed cake, animal cadaver meal, and by-products made from animal cadavers after extraction of glue.

On the use of mill wastes, particularly weed seeds, as war-time feeding stuffs, M. Kling (*Landw. Jahrb. Bayern, 7 (1917), No. 9, pp. 718–738*).—The author has examined various materials made from screenings and other cereal wastes, and on the basis of their chemical composition gives them only a qualified endorsement as feeding stuffs, but points out that they could probably be utilized by poultry. Chemical analyses of 19 weed seeds likely to be found in such waste products are presented.

Beet top silage and other by-products of the sugar beet, J. W. Jones (*U. S. Dept. Agr., Farmers' Bul. 1095 (1919), pp. 24, figs. 12*).—The author cites a number of instances of the utilization of beet tops, beet pulp, beet molasses, and beet "tails" by cattle and sheep, and gives directions for ensiling beet tops in pits. Properly made beet top silage, it is held, can be used to replace half the alfalfa ration.

Rules and regulations Texas feed law (*Texas Sta. Control Circ. C (1918), pp. 8*).—This circular gives the text of 38 regulations, effective September 1, 1918, adopted by the director of the station under the provisions of the Texas feed law. They have also been printed in Bulletin 234 (E. S. R., 43, p. 571).

Utilization of [irrigated] crops with live stock, B. Aune (*U. S. Dept. Agr., Dept. Circ. 60 (1919), pp. 16–24, fig. 1*).—This is the 1918 annual report of the experiments conducted by the Bureau of Plant Industry as to the utilization by live stock of the crops grown on the Belle Fourche reclamation project experiment farm.

The pasture tests with dairy stock (E. S. R., 40, p. 374) have been continued. The plat seeded with brome grass, slender wheat grass, and alfalfa in 1915 again provided longer and better pasturage for cows than the three more elaborate grass combinations seeded the same year. No tendency to bloat was noted. The brome grass, tall oat grass, and sweet clover plat seeded in 1916 was not pastured, but the three other relatively simple 1916 mixtures were again found satisfactory in tests with cows and heifers.

As in previous years (E. S. R., 40, p. 371), two groups of hogs and a group of ewes and lambs were used to graze the third-year stands of alfalfa in three 6-year rotation experiments. The hogs were carried for 121 days and were fed a 2 per cent corn ration, one group consuming 2.51 lbs. and the other 2.28 lbs. per pound of gain. The gains per acre were 1,942 and 2,138 lbs., respectively. In September hogs were put onto the corn plats in the same two rotations. One plat produced 758 and the other 667 lbs. of gain, the corn provided per pound of gain being estimated as 4.1 and 4.7 lbs., respectively. Tables summarize the results of hog tests during all the years of the experiment.

The ewes on pasture (8 to an acre) maintained their weight and the lambs gained 0.46 lb. per head daily during the 81-day period. On September 6 four range lambs and 4 from the alfalfa pasture were used to harvest the corn and consume the beet tops from the beet crop of the same rotation. They were carried 61 days and gained 612 lbs. per acre. The range lambs made only one-third of this gain. At the beginning of the corn feeding, while the lambs had access to some rape which had been seeded in the corn, they scoured badly.

It is stated that loss from bloat in these lamb-pasturing tests with alfalfa has not been serious.

Introduction of breeding stock [into Brazil]—Acclimatization—How European cattle adjust themselves, P. Cavalcanti (*Bol. Min. Agr., Indus. e Com. [Brazil], 7 (1918), No. 2, pp. 47–52*).—The author gives an account of the climatic zones in Brazil and the live-stock needs of different regions. It is stated that importers of pure-bred stock prefer Holstein, Flemish, Brown Swiss, Guernsey, Limousin, and Hereford cattle, Catalonian asses, Arab horses, and Romney-Marsh and Oxford Down sheep. Despite a relatively high mortality rate, Herefords are popular because they withstand changes in temperature and maintain themselves or even increase in weight on dry forage during the winter months.

Brazil as a market for pure-bred cattle, M. Mackenzie (*Breeder's Gaz., 76 (1919), No. 26, pp. 1364, 1365, 1488, figs. 10*).—The author states that the

Brazilian cattle industry has gone beyond the stage where Zebu bulls satisfy all the demands for improved beef stock, and gives a brief account of his own success in importing pure-bred Herefords and Shorthorns of both sexes from Texas and in crossing the bulls with native cows. Acclimatization difficulties were not encountered.

Breeds of cattle and their improvement in Colombia, I. GONZÁLEZ TORRES (*Rev. Agr. [Colombia], 4 (1918), No. 1, pp. 12–25, figs. 2*).—The author gives a brief account of the development of the cattle industry in Colombia since the first importations from Andalusia in 1570. Separate paragraphs are devoted to the Shorthorn, Polled Durham, Angus, Devon, Sussex, Red Polled, Galloway, and Hereford breeds. The Herefords are considered the most adaptable to the climatic conditions.

The author records a growing dissatisfaction with zebus and zebu crosses because of their conformation, the poor quality of their meat, and their ferocious dispositions. Although the hump is thought to have excellent flavor, this quality alone is not now considered sufficient to make the species desirable for meat purposes.

Measures taken by the Government to encourage importation of improved cattle are explained.

Effect of organic nutrients on animal growth and reproduction (*Wisconsin Sta. Bul. 302 (1919), pp. 54, 55, fig. 1*).—Previous work of Hart et al. on the deficiencies of the wheat plant (E. S. R., 36, p. 865; 39, p. 71) has been continued. Although middlings, starch, and corn stover made a satisfactory ration for pregnant cows, the substitution of bran for middlings resulted in the disease known as miller's bran disease; the calves produced were underweight, and lived only a few hours. The condition is attributed in part to insufficient roughage, since the amount of corn stover was reduced so as to provide a proper protein intake.

Poor calves also resulted with a ration of oat meal and oat straw supplemented with casein or butter fat. Mineral deficiency is indicated, as the addition of calcium acetate or wood ashes remedied matters. The working hypothesis developed to explain this is that a deficiency in the calcium intake disturbs the permeability of the intestinal wall. No trouble occurred when roughage high in calcium was fed with oats.

Cattle feeding investigations, 1918–19, C. W. MCCAMPBELL, F. W. BELL, and H. B. WINCHESTER (*Kansas Sta. Circ. 77 (1919), pp. 11, fig. 1*).—In part 1 of this circular McCampbell and Winchester report a 120-day test with 39 two-year-old steers (divided into 4 lots) to study the economy of reducing the corn ration so as to secure maximum utilization of alfalfa hay and sorghum silage. The plan of the experiment and the main results are indicated in the table. A daily ration of 2.7 lbs. of linseed meal per head was given each lot.

Replacement of corn by sorghum silage in a 120-day feeding test with 39 steers.

Lot.	Corn feeding.	Silage ration per head.	Initial average weight of a steer.	Daily gain per head.	Feed consumed per pound of gain.				Shrinkage (120 miles).	Dressing weight.	Rank of carcasses.
					Ground corn.	Linseed meal.	Alfalfa hay.	Sorghum silage.			
		Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Per ct.*	*Per ct.*	
1	Full feed....	....	915	3.23	4.78	0.85	4.07	....	3.18	59.7	2
2	.....do.......	25.3	950	3.07	4.92	.87	.96	8.2	3.11	61.1	1
3	Half feed....	41.8	960	2.63	2.92	1.03	1.13	15.9	3.54	60.4	3
4	None.........	60.3	963	3.09	....	.87	.95	19.5	5.40	56.8	4

Lots 2, 3, and 4 showed only trifling differences in the amounts of hay consumed. At the prices charged all the lots were marketed at a loss, but the loss was least in lot 4 despite greater shrinkage, a cut in the selling price, and no returns from hogs.

In part 2, Bell reports a 90-day comparison between corn silage and sorghum silage for fattening baby beef. Fifteen steer and 15 spayed heifer calves (averaging about 460 lbs. per head) were divided into 2 lots. The same amounts of ground corn, linseed meal, alfalfa hay, and silage were fed to each lot. The corn-silage lot gained at the rate of 2.54 lbs. and the sorghum-silage lot at the rate of 2.62 lbs. per head daily. The latter lot dressed out better than the former and were judged first in quality by the packers; the financial returns were also greater. It is stated that the sorghum crop yielded 9 tons of silage per acre and the corn crop (unfavorable season) 3.5 tons.

In part 3 the lot of calves fed sorghum silage are compared with the 2-year-olds of lot 2 of the above table.

"The fact that the 2-year-old steers required 33 per cent more corn, 36 per cent more linseed meal, and 21 per cent more silage than the baby beeves to produce a hundred pounds of gain, commends the feeding of baby beeves to the thoughtful consideration of more Kansas feeders."

Lamb feeding investigations, 1919, A. M. PATERSON (*Kansas Sta. Circ.* 79 (*1919*), *pp. 4, fig. 1*).—A 49-day feeding experiment beginning March 9, 1919, with 7 lots of 35 lambs each is reported. The average initial weight was 65 lbs. and the weight when marketed averaged between 80 and 85 lbs.

A lot fed the basic average daily ration of 1.24 lbs. shelled corn, 1.04 lbs. alfalfa hay, and 1.52 lbs. silage per head made the slowest gain (0.28 lb. per head daily), but ranked fourth in finish (as indicated by selling price). The other rations tested were variants of this. A lot receiving 0.16 lb. linseed meal in addition made the best gain (0.4 lb.), the highest finish, and the most profit. With cottonseed meal as a supplement the gain was 0.34 lb. and with corn gluten feed 0.32 lb. The lot fed the latter supplement ranked sixth in finish. A lot receiving no silage but double the alfalfa allowance ranked second in gain (0.38 lb.), finish, and profit. When hominy feed replaced the corn of the basic ration neither the gain nor the finish was much changed, but the profit was less owing mainly to the higher price charged for this feed. The least satisfactory ration was one in which 1.14 lbs. linseed meal replaced the corn. Although the gain was 0.31 lbs. the lot receiving the ration made the least finish and was marketed at a loss.

Inheritance of characters in sheep, S. F. RUSSELL (*Oklahoma Sta. Bul.* 126 (*1919*), *pp.* 3–22, *figs.* 8).—An account is given of a sheep-crossing experiment begun in 1909 by J. A. Craig with the object of building up a breed of sheep that would combine the early lambing characteristics of the Dorset, the mutton form and hornlessness of the Shropshire, and the hardiness, fine wool, and dense fleece of the Merino. The Rambouillet was substituted for the Merino in 1915. The experiment is still under way.

The following characters were found to be more or less dominant to their opposites: Density of fleece, absence of folds in skin, dark face (Shropshire), early breeding (Dorset), and perhaps mutton conformation. "Of the crossbreds in the F_1 generation the Merino-Dorset seem to have an average lambing time midway between the Dorset and Merino, the Shropshire-Dorset midway between Shropshires and Dorsets, and the Shropshire-Merino midway between the Shropshire and Merino."

[Swine feeding and nutrition studies] (*Wisconsin Sta. Bul.* 302 (*1919*), *pp.* 59–60, 61, 62, 63).—Several progress reports are presented.

Mature sows reared on grains and legume roughages reproduced normally when continued on a mixture of corn, middlings, and linseed meal (8:7:3) either with a small amount of alfalfa (10 per cent of the ration), or entirely without roughage. Previous work had indicated that a higher proportion of roughage was necessary for growing pigs, and it is suggested that the cereals supply mineral matter and vitamins in sufficient quantity for maintenance but not for growth.

In continuation of previous work with forage crops for pigs (E. S. R., 36, p. 866), F. B. Morrison and G. Bohstedt found that a mixture of oats, peas, and rape was slightly more profitable than rape alone, while a mixture of red clover and alfalfa ranked a close third. Red clover in two trials gave larger returns per acre than a mixture of June grass and other native pasture grasses.

To study the place of corn in the winter ration of brood sows, Morrison and Bohstedt fed pregnant gilts in lots of 5 during two winters. One lot receiving ground corn, ground oats, wheat middlings, and tankage (7:6:6:1) required a daily ration of 4.8 lbs. per head to keep them in condition. Another lot was fed ear corn and tankage (15:1) plus what alfalfa they they would eat, and the consumption per head was 1.1 lbs. daily the first winter and 0.24 lb. the second. The view that a ration consisting largely of corn is injurious to brood sows was not confirmed, for the pigs from the second lot of gilts were as vigorous as those from the first. A third lot fed ear corn and alfalfa hay gave good results, but each year the proportion of healthy pigs was slightly smaller than in lot 2.

Morrison and Bohstedt also found that barley feed and tankage did not prove as economical for fattening pigs as ground barley and tankage. With barley at $87.92 a ton, the barley feed was worth only $81.58.

[Feeding] experiments with hogs, B. Aune and S. H. Bober (*U. S. Dept. Agr., Dept. Circ. 60 (1919), pp. 25–32*).—In these pages are recorded the results of experiments with hogs conducted jointly by the Bureau of Plant Industry and Animal Industry at the Belle Fourche reclamation project experiment farm in 1918.

The 1917 comparisons of supplements to alfalfa pasture (E. S. R., 40, p. 871) were repeated with the addition of self-feeder lots. The experiment began May 18 with 112-lb. hogs, and after 51 days the grain-fed hogs were replaced by 82-lb. spring pigs. The results are summarized in the following table, together with two estimates of profits based on different price schedules:

Pasturing pigs on irrigated alfalfa supplemented by grain, 1918.

Supplemental concentrates.	Time on pasture.	Average carrying capacity per acre.	Total gain per acre.	Grain consumed per acre.	Grain per pound of gain.	Returns[1] per acre.	
						Grain 1 cent, pork 7 cents per pound.	Grain 3 cents, pork 15 cents per pound.
	Days.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*		
None	121	1,264	125	....	....	$8.75	$18.75
Barley, 2 per cent ration	121	1,940	1,984	4,880	2.41	90.08	151.20
Shorts, 2 per cent ration	121	1,956	2,042	4,880	2.39	94.14	159.46
Corn, 2 per cent ration	121	1,957	2,040	4,880	2.39	94.00	159.60
Corn in self-feeder	114	3,013	4,609	14,132	3.07	181.31	267.39

[1] On labor and investment.

"The hogs that received no grain were in very poor and unthrifty condition at the close of the pasture season and would scarcely be considered good feeders."

In another experiment five 100-lb. pigs turned into a half-acre plat of corn ate 5.7 lbs. of corn per pound of gain. Three similar lots had access to other feed while hogging down equal acreages of corn of like yield. One of the lots allowed to graze on third-cutting alfalfa required 4.8 lbs. of corn per pound of gain. Another lot consumed 5.1 lbs. of corn and 0.45 lb. of alfalfa hay, and a fourth lot 3.6 lbs. of corn and 0.25 lb. tankage (self-fed) per pound of gain.

Three lots of six 80-lb. pigs were fed 42 days in dry lot to test the value of sugar beets fed alone or with supplements. The feed requirements per pound of gain in the three cases were as follows: (1) Sugar beets alone 44.5 lbs., (2) sugar beets 7.7 lbs., corn 3.8 lbs., (3) sugar betts 5.5 lbs., corn and tankage (15:1) 3.2 lbs. Sugar beets alone produced an average daily gain of only 0.35 lb. per head, and the hogs were in a very unthrifty condition at the end of the test.

Eight Duroc-Jersey sows and their litters were used in a 42-day test, beginning May 18, of supplemental feeds to alfalfa pasture, with the following results:

A 42-day comparison of supplements to alfalfa pasture with sows and their litters, 1918.

Supplemental ration, 2.5 per cent.	Sows per acre.	Pigs per acre.	Average weight of a sow.		Average weight of a pig.		Daily gain of average pig.	Net gain per acre.	Grain per pound of gain.	
			Initial.	Final.	Initial.	Final.			Sows and pigs.	Pigs alone.
			Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Shorts	8	64	296	278	14.0	34.5	0.48	1,174	3.54	3.16
Barley	8	64	267	254	9.5	26.0	.40	970	3.55	3.29
Corn	8	64	226	191	9.0	30.0	.50	1,070	2.94	2.33
Corn, tankage (20:1)	8	60	230	220	14.5	40.5	.61	1,478	2.56	2.43

A less complete summary is also given of a similar test of barley, corn, and corn plus tankage made in 1917.

Eight Duroc-Jersey sows after their litters were weaned were divided into lots of two and carried on alfalfa pasture for 70 days beginning July 8. A lot that received no extra grain lost 7 lbs. per head. The others were given a one per cent ration of (1) corn, (2) barley, or (3) corn and tankage 15:1, and the respective gains were 41, 35, and 74 lbs. per head. A similar test (but without a barley-fed lot) made in 1917 is reported more briefly. In both years the sows fed corn and tankage were the thriftiest at the end of the season.

Swine feeding investigations, 1918–19, C. W. McCampbell, E. F. Ferrin, and H. B. Winchester (*Kansas Sta. Circ. 78 (1919), pp. 7, fig. 1*).—In parts 1 and 2 of this circular C. W. McCampbell reports on a 100-day feeding test with 60 pigs averaging about 75 to 80 lbs. per head, and divided into 6 lots.

Five of the lots were hand-fed for the purpose of comparing 5 protein supplements to corn. "The ration fed in each lot was so planned that the feed cost should be the same in each lot." The following are the amounts (in pounds) of corn and supplement consumed per pound of gain in the several lots: (1) corn 3.8, tankage 0.38; (2) corn 4.8, semisolid buttermilk 0.72; (3) corn

4.1, linseed meal 0.69; (4) corn 4.1, peanut feed meal 0.68; (5) corn 4.1, alfalfa hay 1.27. The average daily gains per head were, respectively, 1.25, 1.11, 1.16, 1.17, and 1.17 lbs. Under the conditions tankage was the most economical supplement, and semisolid buttermilk the least. The sixth lot was given free choice of corn and tankage, consumed 3.3 lbs. of the former and 0.18 lb. of the latter per pound of gain, and grew at the rate of 1.83 lbs. per head daily. This lot thus produced gains much more economically than the lot receiving measured amounts of corn and tankage (10 : 1), and was, indeed, the only lot fed at a profit.

In part 3 the other authors report a 90-day comparison of supplements to shelled corn in growing 55-lb. fall pigs. There were 6 lots of 5 pigs each and the self-feeder free-choice system was used throughout. The amounts of each feed (in pounds) consumed per pound of gain in the respective lots were as follows: (1) Corn 3.6, tankage 0.47; (2) corn 3.0, tankage 0.25, shorts 0.9; (3) corn 2.4, tankage 0.19, shorts 0.95, semisolid buttermilk 0.53; (4) corn 4.1, linseed meal 0.66; (5) corn 2.7, shorts 0.82, linseed meal, 0.52; and (6) corn 2.2, shorts 0.8, semisolid buttermilk 0.59, linseed meal 0.26. The daily gains per head were, respectively, 0.81, 1.07, 1.43, 0.73, 0.99, and 1.31 lbs. The value of a variety of feeds is pointed out. The 2 lots receiving 3 different supplements were fed at the most profit, the 2 lots receiving 2 supplements produced the next highest margins of profit, while the 2 lots receiving only a single supplement made the least profit.

Crushed v. whole oats for work horses (*Wisconsin Sta. Bul. 302 (1919), pp. 63, 64*).—F. B. Morrison, J. G. Fuller, and G. Bohstedt fed one lot of work horses whole oats for 8 weeks, while their teammates received 95 per cent as much crushed oats. Throughout a second 8-week period the rations were reversed. During the whole-oats feeding the horses gained 5.2 lbs. per head and during the crushed-oats feeding 8.6 lbs. The results of this and a previous test (E. S. R., 36, p. 866) "show that the saving by crushing or grinding oats for work horses whose teeth are kept in good condition is much less than has often been claimed, not amounting to more than 5 or 6 per cent."

Horse breeding in France, R. Musset (*L'Elevage du Cheval en France. Paris: Libr. Agr. Maison Rustique, 1917, pp. XXIII+232, figs. 17*).—This is an historical review of horse production in France. The author discusses the climatic and economic conditions influencing horse breeding, the localization of breeds, the use of horses in transportation, the influence of improvement in mechanical transportation on horse types, the horse as a work animal and as a meat animal, and the development of horse breeding in the Perche, Boulonnais, and Basse-Normandie districts. The main essay is preceded by a 50-page bibliography of horse breeding in France since the seventeenth century, including references to pictures, unpublished documents, and official archives.

Zebras and their hybrids as domestic animals, W. Fawcett (*Hacienda, 13 (1918), No. 8, pp. 242–245, figs. 9*).—The author gives a brief history of zebra hybrids illustrated with a number of photographs. It is stated that in zebra× mare hybrids the pattern is not as clear as in ass×zebra hybrids, but that the pattern is very pronounced in crosses between zebra males and Shetland ponies, the stripes of the hybrids in some cases being more marked than those of the sire.

[Nutrition studies with poultry] (*Wisconsin Sta. Bul. 302 (1919), pp. 52, 53*).—Brief notes of results by J. G. Halpin and E. B. Hart are presented.

In studying growth of baby chicks, these investigators found that the proportion of water-soluble vitamins in the diet (as measured by the relative amount of yeast added to purified feeding materials) that is required for the normal growth of chicks is from 5 to 6 times the proportion sufficient for rats of equivalent age. Uncompleted studies of the lime requirements of hens seem to indicate that the iodin content of the feed is as important as the calcium content in preventing soft-shelled eggs. This conclusion is supported by the satisfactory results from the use of grit containing oyster shells or the shells of other marine mollusks.

Judging fowls for egg production, H. R. Lewis (*New Jersey Stas. Hints to Poultrymen, 8 (1919), No. 2, pp. 4*).—A score card is proposed for utility fowls, the points being distributed as follows: Body type (determined by appearance) 25, head and adjuncts 15, body conformation (determined by handling) 30, quality of skin 10, legs and toes 5, and condition 15. A bird is expected to lay 3 eggs during her pullet year for each point attained.

Report of the first Texas national egg-laying contest, F. W. Kazmeier (*Texas Sta. Bul. 246 (1919), pp. 7–22, figs. 7*).—This is an account of an egg-laying contest held in 1917–1918 in which there were 160 birds entered. The scores and egg records of each of these and of 30 alternates are tabulated, and some data are reported as to the feed cost of egg production.

How to load cars of eggs (*U. S. Dept. Agr., Dept. Circ. 55 (1919), pp. 16, figs. 18*).—This consists mainly of a series of diagrams to show the successive steps in packing egg crates on refrigerator cars so as to have the load exactly fit the car. The use of wood buffing in the center and of straw buffing at the bunkers are both illustrated.

How to wrap heads (*U. S. Dept. Agr., Dept. Circ. 52 (1919), pp. 10, figs. 8*).—Directions are given for wrapping in paper the heads of plucked chickens and turkeys that are being packed for the market.

Inheritance of coat color in cats, P. W. Whiting (*Jour. Expt. Zool., 25 (1918), No. 2, pp. 539–569, figs. 8*).—Breeding experiments with cats, involving maltese, white, tortoise-shell, yellow, ashy, and striped conditions of the coat color, are reported.

Although solid white appears to be dominant to all colors, white spotting is irregular in inheritance. To explain a familiar phenomenon, pointed out by Darwin and others, it is suggested that a white spot over the eyes makes them blue, and that if the spot extends over the ear, as would usually be the case, the animal is deaf. It is noted that yellow color in cats provides the only clear case of sex-linked inheritance among mammals aside from some eye defects in man.

Studies on cell division in the albino rat (Mus norwegicus albinus).—III, Spermatogenesis, E. Allen (*Jour. Morph., 31 (1918), No. 1, pp. 133–185, figs. 58*).—The author finds that the haploid number of chromosomes in the male albino rat is 19, and that the spermatogonial number is consistently 37. Sperm dimorphism is produced by the presence of one unpaired accessory (sex chromosome) which divides in the second spermatocyte division. The author was unable to discover structural differences between the cells giving rise to the Sertoli cells and those giving rise to the spermatogonia.

Previous papers of this series have dealt with brain tissue and points of cytological technique.

DAIRY FARMING—DAIRYING.

Value of barley feed and barley bran [for milk production] (*Wisconsin Sta. Bul. 302 (1919), p. 62*).—In an experiment with three lots of six cows, fed by the reversal method for three 3-week periods, F. B. Morrison, G. C. Humphrey, and G. Bohstedt found that barley bran decreased the milk yield 3.86 per cent and barley feed decreased it 0.78 per cent below the yield when wheat bran was fed. In each case the material tested formed 30 per cent of the concentrate ration. With wheat bran at $45 a ton, barley bran was worth $29.56 and barley feed $42.16 a ton.

Cost of milk production in Livingston and Macomb Counties, F. T. Riddell (*Michigan Sta. Quart. Bul., 2 (1919), No. 2, pp. 75–78*).—The data summarized here were collected from a series of Michigan farms which were visited periodically by field accountants during the periods considered.

The average amounts of feed and labor required to produce 100 lbs. of milk (averaging 4 per cent fat) on 25 farms (422 cows) in Macomb County, from October 16, 1918, to May 15, 1919, were as follows: Grain 32.4 lbs., hay 36.7 lbs., corn stover and bean pods 18.8 lbs., silage 209.1 lbs., pasture 0.08 week, bedding 25.6 lbs., operator's labor 1.3 hours, common labor 1.27 hours, and horse labor 0.13 hour. The cost of feed and bedding averaged $2.86. The labor charges totaled 79 cts., hauling charges 14.4 cts., taxes, interest, insurance, and depreciation on cattle (at 15 per cent per annum) and buildings (at 10 per cent) 52.2 cts., and other charges 20.2 cts. Adding a 10 per cent managerial charge and deducting 36.4 cts. for manure and calf, leaves a net cost of $4.06 for milk delivered at the country railroad station.

Three years' averages of the commodities used in producing 100 lbs. of milk (testing 3.35 per cent) in the 7 winter months on 25 farms (1,240 cows) in Livingston County were as follows: Home-grown grain 12 lbs., commercial feeds 19.7 lbs., hay 48.4 lbs., other dry roughage 16.6 lbs., silage 140.4 lbs., other succulence, including soiling crops, 4.5 lbs., pasture 0.17 day, bedding 17.3 lbs., operator's labor 0.92 hour, common labor 1.16 hours, and horse labor 0.13 hour. The hauling cost was 25 cts. and the other expenses averaged 30.9 per cent of the cost of those itemized. It is not stated whether a managerial charge is included in these determinations. A credit of 0.114 ton of manure is allowed, but the value of the calf at birth is held to be offset by sire services.

Milk and cream contests, E. Kelly and G. B. Taylor (*U. S. Dept. Agr., Dept. Circ. 53 (1919), pp. 24, figs. 6*).—This is a revision of Department Bulletin 356 (E. S. R., 34, p. 874). The list of past contests is omitted, a discussion of contests in which the samples are collected on the street is introduced, a modified score card for milk contests is proposed, and the treatment of methods of analysis is amplified. The new score card for milk distributes the points as follows: Bacteria 35, flavor and odor 15, sediment 10, fat 15, solids-not-fat 15, temperature (street samples) or acidity (prepared samples) 5, and bottle and cap 5.

Off flavors in dairy products (*Wisconsin Sta. Bul. 302 (1919), pp. 49, 50*).—By subjecting casein or milk albumin to the action of hydrogen peroxid and iron sulphate, W. Pitz has been able to isolate decomposition products of the milk proteins possessing a pungent and disagreeable odor. Such products impart an off flavor to butter.

On the use of aluminum in dairy practice, Utz (*Ztschr. Angew. Chem., 32 (1919), No. 88, Aufsatzt., pp. 345, 346*).—Experiments are reported showing that sour milk at room temperature has no appreciable effect on aluminum vessels.

Causes and prevention of "leaky" butter (*Wisconsin Sta. Bul. 302 (1919), p. 48, fig. 1*).—Work carried out by A. C. Dahlberg is held to indicate that "leakiness" results from the conditions which produce an open texture (cold wash water, working butter in water, underworking the butter, and a high salt content), and is not affected by the churning temperature or the moisture content of the butter.

Trend of the butter industry in the United States and other countries, T. R. Pirtle (*U. S. Dept. Agr., Dept. Circ. 70 (1919), pp. 24, figs. 26*).—This publication summarizes in graphical form the available statistics as to butter production in the United States (since 1850), Australia, New Zealand, Canada, and Sweden; and the butter trade of these and 10 other countries.

With regard to the butter industry of the United States it is held that farm butter making, and consequently the production of renovated butter, is definitely on the decline. Butter made in the United States has been a very small factor in the international butter trade. Before the European war Great Britain and Germany were the principal butter-importing nations, drawing their supplies from the smaller European countries and from Siberia, Australia, and New Zealand.

"The great Danish export trade has been built up within the last 25 years. Important aids in its development have been the invention of the cream separator in 1879; cooperative dairying beginning in 1882; cooperative factory management in 1887; the use of milk records about 1895; and the 'Lurmarke' or national trade-mark, established by law in 1906." Stringent laws control the quality of Danish export butter.

"The export butter business of nearly all countries shows noticeable fluctuations in short periods of time, indicating that the balance between domestic supplies and the profitable foreign outlet is delicate."

Trend of the cheese industry in the United States and other countries, T. R. PIRTLE (*U. S. Dept. Agr., Dept. Circ. 71* (*1919*), *pp. 24, figs. 25*).—The author presents a series of charts showing graphically the changes in the amounts of cheese made in the United States and the volume of exports and imports since 1850, together with similar information about cheese making and the cheese trade in Canada, New Zealand, the Netherlands, the United Kingdom, Switzerland, France, and other countries. The charts show in particular the development of the factory system in the United States, and the stimulating influence which it has had on production in other countries. They show also the injurious effect on exports of the "filled cheese" episode in the history of American cheese making.

"Countries exporting those varieties of cheese which are especially used for savory purposes appear to have enjoyed a continuous export demand. The variations in their exports are not so marked as in those that made the Cheddar type of cheese.

"The annual cheese consumption in the United States has been less than 4 lbs. per capita during practically all the time of record, and has never reached 5 lbs. per capita as a national average. For the most part the per capita consumption of cheese has been less in the countries using only a few varieties than in those where numerous varieties are used."

Recovering cottage cheese curd from buttermilk, A. E. PERKINS (*Mo. Bul. Ohio Sta., 4* (*1919*), *No. 9, pp. 276–283*).—The author reports in greater detail than in a previous paper (E. S. R., 40, p. 379) the operation of a centrifugal machine by a creamery at Columbus, Ohio, to extract curd from buttermilk. Analyses of the buttermilk, whey, and curd of several runs are tabulated.

From 68 to 82 per cent of the buttermilk casein was recovered in the curd. The whey is sold for feeding purposes at about the same price as buttermilk. The creamery uses ordinary ash butter tubs as wholesale packages, and has adopted the jelly glass as a standard retail package.

VETERINARY MEDICINE.

Instructions for veterinary meat and dairy inspections, C. F. MORSE (*War Dept.* [*U. S.*], *Off. Surg. Gen., Vet. Div. Circ. Letter, 40* (*1919*), *pp. 31*).—Instructions are given under the headings of sanitation, ante-mortem inspection, post-mortem inspection, products inspection, and inspection of dairies and milk herds.

Federal meat inspection as a safeguard to public health, J. R. MOHLER (*Jour. Amer. Vet. Med. Assoc., 56 (1919), No. 3, pp. 302–310*).

Reports of the veterinary director general for the years ended March 31, 1917 and 1918, F. TORRANCE (*Rpt. Vet. Dir. Gen. Canada, 1917, pp. 19; 1918, pp. 24*).—These reports (E. S. R., 38, p. 581) deal with infectious diseases of live stock, including glanders, hog cholera, dourine, scabies, rabies, tuberculosis, anthrax, etc., and give accounts of import and export inspections, meat inspections, etc.

Yearbook of pharmacy (*London: J. & A. Churchill, 1919, pp.* [8]+*519, pls. 6, figs. 15*).—This volume comprises abstracts of papers relating to pharmacy, materia medica, and chemistry contributed to British and foreign journals from July 1, 1918, to June 30, 1919, together with the transactions of the British Pharmaceutical Conference at its fifty-sixth annual meeting on July 22 and 23, 1919. The chemical abstracts are under the editorship of J. O. Braithwaite, the new remedies of T. Stephenson, and the transactions of C. H. Hampshire.

Semiliquid media for the examination and culture of anaerobic organisms in veterinary medicine, J. LIGNIÈRES (*Bul. Soc. Cent. Méd. Vét., 95 (1919), No. 20, pp. 353–356*).—A 0.25 per cent semiliquid agar medium is recommended for the culture of anaerobic organisms as well as aerobic and facultative aerobic organisms.

As an example of the application of this medium to veterinary practice, the author describes the quick and luxuriant growth of the bacillus of blackleg in such a medium.

The loco weed and its eradication, L. V. MEDLEY (*Producer, 1 (1919), No. 5, pp. 12, 13, fig. 1*).—The author reports the finding of a grub which works from the stem around the root of the loco weed, thus girdling and killing the plant. In some loco fields examined about every tenth plant was found in a dying condition as a result of attack by this grub. The author also reports finding a small worm feeding upon the seed, the seeds in pods examined having been destroyed by it.

Studies on anthelmintics.—VI. Tests of the administration of anthelmintics in enteric-coated soft gelatin (soluble elastic) capsules, M. C. HALL (*Jour. Amer. Vet. Med. Assoc., 56 (1919), No. 3, pp. 310–316*).—This is in continuation of the papers previously noted (E. S. R., 42, p. 180).

"The results obtained by the use of formalin-gelatin enteric coats, inclosing a mixture of oil of chenopodium and chloroform, are not satisfactory. On the other hand, the results obtained by the use of the talc-shellac coat are unusually good, the minimum therapeutic dose removing all the ascarids present from 14 infested dogs."

Nonspecific complement binding substances in horse blood, A. MARCIS (*Berlin. Tierärztl. Wchnschr., 34 (1918), No. 19, pp. 181–183*).—The author reports that of 5,000 complement fixation tests for glanders, 17 after inactivation at 56° C. to destroy the nonspecific complement binding substance still gave complement fixation tests without the addition of antigen. In 12 of these cases the test was repeated after heating the blood to 60° for one-half hour with positive results in 4, doubtful in 1, and negative in 7 cases. Six of these blood tests came from horses proved on autopsy to be glandered, and of these 6 cases, 4 gave similar complement fixation reactions after the blood sera had been heated to 60° with or without the addition of antigen. The author explains the positive reactions in the absence of antigen after heating to 60° as due to the presence in the blood not of nonspecific complement binding substances but of glanders bacilli or their decomposition products. The blood in such cases contains both components for the complement fixation reaction, and the addition of antigens (extract of glanders bacilli) is not necessary.

As a result of this investigation the author emphasizes the necessity of heating the blood sera to 60 instead of 56° before making the complement fixation test. A positive reaction will then indicate a glandered condition, even if no antigen has been added.

War experiences in regard to the relation between gas gangrene in man and blackleg in animals, Steinbrück (*Berlin. Tierärztl. Wchnschr., 34 (1918), No. 45, pp. 441–448*).—This is essentially a digest of recent German literature, showing the similarity between gas gangrene and blackleg.

Further experiments in active immunization against glanders, A. Marxer (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 28 (1919), No. 6, pp. 410–433*).—The earlier work of the author and coworkers (E. S. R., 20, p. 1085), Bautz and Machodin (E. S. R., 24, p. 83), and Dediulin (E. S. R., 27, p. 879) on immunization against glanders with killed glanders bacilli is reviewed, and further experiments are reported which indicate that immunization can be brought about with a glycerin extract of killed bacilli, but not with an ammoniacal solution or tricresol solution of the same. It is also shown that the serological reactions following the injection of killed bacilli vary in time and intensity with the individual animals, and that the subcutaneous injection of 0.000004 loop-full of live anthrax bacilli is sufficient to kill a horse.

In testing for glanders it is advised that more than one reaction be used, preferably the ophthalmic and complement fixation reactions. Owing to the possibility of a nonspecific reaction in the former tests, it is recommended that mallein be used in one eye and a nonspecific substance in the other.

Irregular results in the complement deviation reaction for glanders occasioned by variations in technique, W. Pfeiler (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 28 (1919), No. 6, pp. 498–516*).—Following introductory remarks regarding the technique of the complement deviation reaction for glanders, the author presents the results of a comparative study of the reaction as conducted on a water bath or in an incubator. The evidence obtained indicates that the more reliable results are obtained with the use of the water bath.

Therapeutic and prophylactic inoculation of cows with Friedmann's tuberculosis vaccine, O. Gutknecht (*Berlin. Tierärztl. Wchnschr., 34 (1918), No. 39, pp. 381–383*).—Case reports are given of the successful use of Friedmann's tuberculosis vaccine in the treatment of bovine tuberculosis and also in the immunization of calves.

The preparation and distribution of tuberculin by the Bureau of Animal Industry, M. Dorset (*Jour. Amer. Vet. Med. Assoc., 56 (1919), No. 3, pp. 282–291, figs. 2*).

Tuberculosis eradication under the accredited-herd plan.—Herd list No. 2 (*U. S. Dept. Agr., Dept. Circ. 54 (1919), pp. 96, pl. 1*).—This is a second list revised to April 1, 1919, of herds officially accredited as free from tuberculosis and of herds that have passed successfully one test with a view to certification. The different breeds of cattle, names of the owners, and States where the herds are located are arranged in alphabetical order, and several summary lists are included. There are shown to be 782 herds, containing 12,082 pure-bred and 6,989 grade animals now accredited, and 6,535 herds containing 39,558 pure-bred and 57,685 grade animals once tested without reactors.

Tuberculosis eradication conference shows nation-wide interest in disease-free herds (*Amer. Jour. Vet. Med., 14 (1919), No. 11, pp. 555–558, 564*).—This is a report of a conference of those interested in the control and eradication of tuberculosis among cattle and hogs, held at Chicago, October 6–8, 1919. The report includes an address of J. R. Mohler, chief of the Bureau of Animal Industry of the U. S. Department of Agriculture.

Diseases prevalent among horses and cattle in Mississippi, E. M. Ranck (*Miss. Agr. Col., Ext. Bul. 11* (*1919*), *pp. 23*).—A popular summary of information on the more important diseases of live stock in Mississippi.

A malarial parasite in the blood of a buffalo, A. L. Sheather (*Agr. Research Inst. Pusa Bul. 90* (*1919*), *pp. 5, pls. 2*).—The author describes a parasite found in the blood of an Indian buffalo for which the name *Plasmodium bubalis* is suggested.

An outbreak of blackleg in sheep, H. Marsh (*Jour. Amer. Vet. Med. Assoc., 56* (*1919*), *No. 3, pp. 319–321*).—The author records an outbreak of blackleg in a flock of sheep at Drummond, Mont.

Stomach worms in sheep: Prevention and treatment (*U. S. Dept. Agr., Dept. Circ. 47* (*1919*), *pp. 12*).—This is a popular summary of what is known of the stomach worm of sheep and methods for its prevention and control, presented in the form of answers to practical questions.

Differential diagnosis of infectious swine diseases, A. T. Kinsley, W. W. Dimock, and W. E. King (*Amer. Jour. Vet. Med., 15* (*1920*), *No. 1, pp. 22–24*).—A report presented at the meeting of the U. S. Live Stock Sanitary Association in Chicago, in December, 1919.

The longevity of the virus of hog cholera, H. C. H. Kernkamp (*Cornell Vet., 10* (*1920*), *No. 1, pp. 1–7*).—An investigation is reported from the Minnesota Experiment Station of the longevity of hog cholera virus preserved with 0.5 per cent phenol and 1 per cent glycerol and kept in a refrigerator at 45° F. in tightly corked and sealed bottles.

From inoculation tests with this virus at varying intervals of time, results were obtained which indicate that under such conditions the virulence of the virus is not destroyed up to 1,000 days, or approximately three years of age. It is pointed out that these results are not fully in accordance with the statements of Craig and Whiting (E. S. R., 38, p. 688) that carbolized blood began to lose its virulence by the nineteenth day and was practically nonvirulent at the end of a year.

Comparing swine plague to hog cholera, R. Jay (*Amer. Jour. Vet. Med., 15* (*1920*), *No. 2, pp. 59–61, 76*).—Attention is called to the appearance of swine plague simultaneously with or subsequently to hog cholera as a possible cause of the small percentages of failures to immunize against the latter disease. The two diseases are compared as to history, pathogenesis, symptoms, morbid changes, mortality, and immunization. In conclusion it is pointed out that it is a mistake to inject hog cholera virus into a hog suffering from swine plague, and that the best time for immunization against hog cholera is during the summer months, when the pigs can get plenty of exercise and are not subjected to the predisposing causes of swine plague.

The use of carbon bisulphid in infestations with bots, Gastrophilus spp., M. C. Hall and L. Avery (*Jour. Amer. Vet. Med. Assoc., 56* (*1919*), *No. 3, pp. 265–270*).—This account is based upon experiments by agents of the Bureau of Animal Industry of the U. S. Department of Agriculture with carbon bisulphid on four horses in order to ascertain the minimum effective dose and the effect of the simultaneous use of a purgative.

The results indicate that all bots present in the stomach and duodenum will be removed by the use of a single dose of 6 dr. of carbon bisulphid or by two doses of 4 dr. each with an interval of 4 hours, or by three doses of 3 dr. each at 1-hour intervals, when given without purgation or with purgation at least several hours before or after treatment. The single dose gives a smaller total of the drug and saves time, whereas repeated doses give an opportunity to suspend treatment if bad results are evident after the first dose.

Doses of 4 or 5 dr. will remove all *G. intestinalis* in their usual location in the cardiac stomach, but will leave some or all of the *G. nasalis*.

Pathology of dourine, with special reference to the microscopic changes in nerve tissues and other structures, R. J. FORMAD (*Jour. Agr. Research* [*U. S.*], *18* (*1919*), *No. 3*, *pp. 145–154*).—This paper from the Bureau of Animal Industry of the U. S. Department of Agriculture describes the microscopic lesions found in nerve tissues and other affected parts, based upon material from several well-developed chronic cases of dourine in horses from Montana and Iowa, in which the disease had been recognized clinically and the animals had reacted to the complement-fixation test. The tissues studied were brain, spinal cord, spinal ganglia, and peripheral nerves.

"The microscopic examination of the brain showed no appreciable changes in the nerve cells, the supporting tissue, or in the blood vessels. In the cervical, anterior, and middle dorsal portions of the spinal cord lesions could not be demonstrated even with the most sensitive methods of staining; and in the posterior dorsal portion the lesions were very slight, gradually increasing in the lumbar enlargement and becoming most marked in the sacral region. Degeneration in the sensory ganglion cells was present in all stages, varying from the beginning stage of chromatolysis that could barely be detected by the Nissel method alone to advanced degeneration and disintegration of plasmolysis that was brought out by less sensitive methods. The motor ganglion cells and the cells in the column of Clark showed such slight alteration that it was difficult to trace chromatolysis in them. The nerve cells of the spinal ganglia showed chromatolysis in varying degrees. The most marked changes were found in the sensory cells in the sacral region, where disintegration of the chromatophil granules was followed by atrophy and sclerosis and was invariably accompanied by peripheral displacement of the nuclei. This was not observed in the nerve cells of the cord.

"The degeneration of the myelin in the medullated fibers was even more pronounced than the degeneration in nerve cells. The black clumps of degenerated myelin stained by the osmic acid of the Marchi method were the characteristic feature of the endoneural and extraneural fibers in the gray substance in the dorsal horns and the dorsal nerve roots, as well as of the fibers of the columns of Burdach and Goll in the white substance of the cord. The changes were limited to the lumbar and sacral region. . . . In the sciatic nerve the degeneration was even more marked. We can therefore assume that the disturbances are of peripheral rather than central origin."

Experimental studies on equine piroplasmosis, III, P. J. DU TOIT (*Arch. Schiffs u. Tropen Hyg.*, *23* (*1919*), *No. 16*, *pp. 359–368*, *fig. 1*).—In continuation of the work previously noted (E. S. R., 42, p. 178), the author deals with the experimental transmission of *Piroplasma caballi* by ticks. While experiments with *Ixodes ricinus* indicate that it does not transmit *P. caballi*, they show that *Dermacentor reticulatus* does transmit this parasite. The infected tick can transmit the disease to susceptible animals in both the nymphal and adult stages through infection imbibed in the larval stage.

A simplification of the method of treating joint-ill with serum from the blood of the mother, G. FORSSELL (*Berlin. Tierärztl. Wchnschr.*, *34* (*1918*), *No. 9*, *pp. 81*, *82*).—A simplification of the author's method of treating joint-ill,[1] an application of which by Mann (E. S. R., 41, p. 879) has been previously noted, is suggested. This consists in using citrated whole blood in place of blood serum. The blood from the mother is drawn directly into a vessel containing 100 cc. of a 2 per cent sodium citrate solution, which has been thoroughly shaken in the vessel to insure wetting all of the inner surface. If more than a liter of blood is drawn another 100 cc. portion of the citrate solution should be added after the first liter has been obtained. Blood thus treated can be injected intravenously into the foal, care being taken that it is used at body temperature. As a special precaution the blood may be filtered through four layers of gauze before injection.

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[1] Berlin. Tierärztl. Wchnschr., 32 (1916), No. 12, pp. 133–135, fig. 1.

The treatment of tetanus in horses, SCHOCK (*Berlin. Tierärztl. Wchnschr., 34 (1918), No. 43, pp. 421–423*).—Measures for the prevention and treatment of tetanus in horses are discussed. The prophylactic application of iodin to wounds and vaccination with tetanus antitoxin serum are considered by the author to be the most effective measures.

Fowl plague in Argentina, A. ANDRIEU and C. H. BADANO (*Rev. Zootéc., 6 (1919), No. 72, pp. 808–815, pls. 2*).—The authors report studies conducted which demonstrate the occurrence of this disease in Argentina.

On the life history of Ascaris lumbricoides, IV, F. H. STEWART (*Parasitology, 11 (1919), No. 3–4, pp. 385–387, pl. 1*).—The author reports briefly upon experiments carried on in continuation of those previously noted (E. S. R., 39, p. 587) in which ripe eggs of *Ascaris suilla* were fed to suckling pigs and to young white rats. A report on this has been previously noted (E. S. R., 41, p. 285). A description is given of the anatomy of the larva of *A suilla* from the intestine of the pig 14 days after infection.

RURAL ENGINEERING.

Geology and water resources of the Gila and San Carlos Valleys in the San Carlos Indian Reservation, Ariz., A. T. SCHWENNESEN (*U. S. Geol. Survey, Water-Supply Paper 450–A (1919), pp. 27, pls. 4, figs. 2*).—This report deals with the geology and water resources of an area of 4,595 acres and of a second area of 1,840 acres of arable land in the San Carlos Reservation in Arizona, with particular reference to the feasibility of drilling for an irrigation water supply. The principal source of water in the valley alluvium is believed to be seepage from the rivers.

The waters from shallow wells in the Gila Valley are heavily mineralized. They are so high in chlorin that they are of doubtful value for irrigation, and if used continuously they would require extraordinary precautions to prevent an excessive accumulation of alkali in the soil. The shallow ground waters in the San Carlos Valley are believed to be better than those of the Gila Valley, and comparable to the water from the Gila River, which is now successfully used for irrigation.

In the Gila Basin, structure favorable to artesian conditions exists on one or both sides of the valley between the east boundary of the reservation and San Carlos, and it is believed that artesian water can be obtained in the river valley between these points. In the San Carlos Basin, structure favorable to artesian conditions exists only on the west side, adjacent to that part of the valley included within the proposed reservoir.

Surface water supply of western Gulf of Mexico Basins, 1917 (*U. S. Geol. Survey, Water-Supply Paper 458 (1919), pp. 106+XXVIII, pls. 2*).—This report, prepared in cooperation with the State of Texas, presents the results of measurements of flow made on streams in basins of the western Gulf of Mexico during the year ended September 30, 1917.

Surface water supply of Missouri River Basin, 1916 (*U. S. Geol. Survey, Water-Supply Paper 436 (1919), pp. 256+XLIII, pls. 2*).—This report, prepared in cooperation with the States of Colorado, Montana, and Wyoming, presents the results of measurements of flow made on streams in the Missouri River Basin during the year ended September 30, 1916.

Organization, methods, and work of the hydrologic service, C. BASADRE (*Min. Fomento, Bol. Cuerpo Ingen. Minas Perú, No. 84 (1917), pp. 187, pls. 41*).—This bulletin describes the functions and activities of the hydrologic service of Peru, and presents the results of measurements of flow made on streams near the Peruvian coast during the years 1912, 1913, 1914, and 1915.

Comparative value of bacteriological and chemical analyses of drinking water, M. BRULÉ and R. HAZARD (*Presse Méd. [Paris], 26 (1918), No. 23, pp. 211, 212; abs. in Chem. Abs., 13 (1919), No. 14, pt. 1, p. 1608*).—In a total of 882 examinations it was found that the bacteriological results were directly contradictory to the results of chemical analyses in 258 cases, or 29 per cent. In 21 per cent of the cases the chemical analyses indicated that the water was bad, while the bacteriological analyses indicated that it was good. In 8 per cent of the cases the reverse was true. It is concluded that chemical analyses should be used to judge the quality of water in emergency cases only and that the bacteriological analyses should be the final basis of judgment.

Irrigation in the United States, R. H. WHITBECK (*Geogr. Jour., 54 (1919), No. 4, pp. 221–231, pls. 4, figs. 2*).—This is a brief review of the history of irrigation in the United States, dealing especially with the work of the Reclamation Service.

Irrigation in India, Review for 1917–18 (*Simla: Pub. Works Dept. Govt. India, 1919, pp. II+92, pls. 34*).—This is a report of the work and expenditures of the Public Works Department of India, relating to irrigation, for the year 1917–18.

Some factors affecting the efficiency in the use of canal water, W. ROBERTS and O. T. FAULKNER (*Agr. Jour. India, Indian Sci. Cong. No., 1918, pp. 81–88*).—The losses of irrigation water in India are discussed as being due to the nature of construction of canals, to inefficient distribution, and to field practice.

Construction methods used in building the lower reservoir dam of the Balmorhea project, V. L. SULLIVAN (*Proc. Amer. Soc. Civ. Engin., 44 (1918), No. 4, pp. 539–548, figs. 7*).—The purpose of the author in describing these works was "to present economical and practical methods of constructing earth dams. In many cases, where the foundations are poor and a long section is to be built, these methods may suggest a solution which will enable the construction of a dam which otherwise would be impracticable or expensive."

Earth pressures, L. HUDSON (*Trans. Amer. Soc. Munic. Impr., 24 (1917–18), No. 3, pp. 128–135, figs. 11*).—This is a discussion of the theory of earth pressures, resulting in the derivation of working formulas and data.

Colby silt loam needs drainage (*Wisconsin Sta. Bul. 302 (1919), pp. 40, 41, figs. 2*).—In experiments on the effect of tiling on crops 1, 2, 3, and 4 rods from the tile, conducted at the Marshfield substation, the most striking results were obtained with potatoes. An average for three years showed 163 bu. potatoes on plats 1 rod from the tile, with a gradual reduction to 121 bu. per acre on plats 4 rods from the tile. The yield of corn stover on the plat 4 rods from the tile was 2,790 lbs., while that on the plats adjoining the tile was 3,400 lbs. Yields of alfalfa and barley were also better nearer the tile.

Effect of soil moisture on efficiency of dynamite (*Wisconsin Sta. Bul. 302 (1919), p. 35*).—Experiments by J. Swenehart on the use of explosives in land clearing indicate that it costs about 50 per cent more to remove stumps by the use of explosives during the dry part of the summer than it does in late fall when the soil is wet. Comparisons on silt loam soil, using 20 per cent dynamite, showed an average cost of 55 cts. per stump under dry conditions as contrasted with 36 cts. under wet conditions.

Seventh biennial report of the State highway commissioner, F. F. ROGERS (*Bien. Rpt. State Highway Commr. Mich., 7 (1917–18), pp. 148, pls. 53, figs. 18*).—This report covers the work done by the Michigan Highway Department during the two years ended June 30, 1918.

During the period covered by the report 1,880 miles of State rewarded roads were built, 440 miles of which are on State trunk lines. In all 5,771 miles of State reward roads have been completed, more than one-fifth (1,198 miles) of which are on the State trunk line system. These figures show an increase of more than 46 per cent in the total improved mileage during the biennium.

First report of the Board of Directors of the Department of Highways, W. B. ALEXANDER (*[Bien.] Rpt. Bd. Dir. Dept. Highways [Nev.], 1 (1917–18), pp. 43, pl. 1, figs. 12*).—This report presents the activities of the Nevada State Highway Department for the biennial period ended December 31, 1918.

Seventh biennial report of the State Highway Department relative to highway improvement, F. E. EVERETT (*Bien. Rpt. State Highway Dept. [N. H.], 7 (1917–18), pp. 214, pls. 5, figs. 8*).—This report presents the activities of the New Hampshire Highway Department for the years 1917 and 1918.

Report of the State Commissioner of Highways, E. DUFFEY (*Rpt. State Comm. Highways, N. Y., 1917, pp. 592*).—This is a report of the activities of the New York State Highway Commission for the year 1917.

Fifth biennial report of the State Road Commission, I. R. BROWNING (*Bien. Rpt. State Road Comm. Utah, 5 (1917–18), pp. 200, figs. 11*).—This report presents the activities of the Utah State Highway Commission for the two years 1917 and 1918.

Final report of the special committee on materials for road construction and on standards for their test and use, A. H. BLANCHARD (*Proc. Amer. Soc. Civ. Engin., 43 (1917), No. 10, pp. 2327–2408*).—This is a detailed report of the conclusions of the committee.

Wear resisting pavements, J. B. PÉRÉGRIN (*Rev. Chim. Indus., 27 (1918), No. 322, p. 210; abs. in Chem. Abs., 13 (1919), No. 17, p. 2117*).—Tests are reported of a new material as aggregate in pavements called Arpax ruby. This is a silicate of iron containing a little aluminum, iron, calcium, and manganese. It is mixed with cement or asphalt and applied as a wearing coat. A block of asphalt and gravel at 65° F. was penetrated 14 mm. by a rod 20 mm. in diameter by 20 cm. long under a load of 6 kg., while a mixture of asphalt and Arpax ruby with the same rod and a load of 26 kg. showed a penetration of only 1.1 mm. In an abrasion test cement and Arpax ruby showed a wear of 1.8 for 4,000 revolutions, while asphalt and Arpax ruby showed a wear of 0.9 mm. for 1,000 revolutions. Comparative wearing tests with other materials showed the asphalt and Arpax ruby to be the most resistant. The method of use is described.

Concrete pavements, M. A. STEWART (*Trans. Amer. Soc. Munic. Impr., 24 (1917–18), No. 3, pp. 114–123, figs. 3*).—This is a review of experimental work undertaken to ascertain the respective merits of different classes of concrete and different methods of construction. The details of the composition and construction of seven sections of experimental concrete road, each approximately 700 ft. in length, are given. A traffic census was taken at various points from September 5 to September 11, 1915, inclusive, when the pavement was about one year old. It was found that for 12 hours each day, from 7 a. m. to 7 p. m., an average of 1,809 vehicles passed a given point.

The mixture which seems to have given the most satisfactory result consists of one part cement, one and one-half of sand, and three of 1-in. trap rock. Certain sections also, which were reinforced, have shown up to great advantage compared to those which contained no reinforcing material, the latter in some cases being badly cracked owing to the unstable base and aggravated surface water conditions.

While it is not thought that reinforcing will entirely eliminate cracking, further experiments showed that it is clearly an advisable procedure. Experiments with joints showed that the most satisfactory form consists of the introduction of a ½-in. strip of manufactured filler, so placed as to permit of a small projection above the surface to allow for protection of the edges.

Chemistry of concrete, A. Blackie (*Canad. Engin., 35 (1918), No. 10, pp. 231–233; also in Engin. and Contract., 50 (1918), No. 22, pp. 503–505*).—Work by the Montana and Wyoming Experiment Stations and by the U. S. Bureau of Standards bearing on the subject are reviewed and summarized, and experiments conducted at Winnipeg, Canada, are reported on the effect of the various alkali solutions on concrete made of local sands and on the sands themselves.

Extraction of a sand containing 3.71 per cent calcium with a 10 per cent solution of magnesium sulphate and a solution containing 5 per cent calcium sulphate and 10 per cent sodium chlorid showed that to some extent these solutions had a solvent effect upon the lime in the sand.

Further tests in which briquettes made of 1:3 cement and crushed limestone were placed in 5 per cent magnesium sulphate solution, 10 per cent sodium sulphate solution, a solution containing 5 per cent calcium sulphate and 5 per cent sodium chlorid, and a solution made from white soil deposit containing about 62.5 per cent calcium sulphate and 37.5 per cent magnesium sulphate showed that the briquettes deteriorated rapidly by softening of the edges and reduction in tensile strength. The solutions also became turbid.

In further tests four sands differing in grading and chemical composition were made into 1:2 and 1:3 cement briquettes. These, with neat cement briquettes were placed in distilled water, tap water, and 10 per cent magnesium sulphate and sodium sulphate solutions. Half the briquettes were steamed at 150° F. before immersion. "In general 1:2 mortars withstood the action of the sulphates better than the 1:3 mortars and the unsteamed briquettes better than the steamed."

Density tests showed that "in general for a given cement content the mortar with the lowest density distintegrated first.

"In the case of standard Ottawa sand 1:3 mortar there is insufficient cement paste present to fill the voids in the sand. These briquettes disintegrated very badly. The neat cement specimens were practically unacted upon. One of the mortars on removal from the sulphate solutions showed a strength after 3½ months of 600 lbs., whereas the strength of same mortar in distilled water for same time was 360 lbs."

It is tentatively concluded that the action of the sulphate on cement mortar is proportional to the porosity of the mortar. It is thought that further investigation is necessary before drawing final conclusions.

Some tests of Douglas fir after long use, A. C. Alvarez (*Univ. Cal. Pubs. Engin., 2 (1918), No. 3, pp. 57–118, pls. 16, fig. 1*).—This is a report of a series of about 1,200 tests made on Douglas fir to determine its strength, elastic properties, and moisture content after 36 years' use in a typical frame building. The strength tests included beam, compression, longitudinal shearing, and impact flexure tests.

It was found that as housed within the walls and floors of the ordinary type of timber frame building, a good grade of Douglas fir after long use does not decay but remains sound and reaches a moisture content which corresponds to a thoroughly air-seasoned condition. The static strength of Douglas fir heartwood fiber without defects, as determined by the tests in compression parallel to grain and in longitudinal shear on small specimens, does not deteriorate after long use, but is equal to that of freshly cut Douglas fir heartwood fiber dried to the same moisture content, and is considerably greater than that of the latter in the condition known on the market as air-seasoned.

The modulus of elasticity for compression parallel to grain of Douglas fir wood fiber after long use is about twice that of air-seasoned, freshly cut Douglas fir, but for large beams with ordinary defects the modulus of elasticity of the long-used timber is only slightly the greater. The static strength of Douglas fir beams in structural sizes with ordinary defects does not deteriorate after long use, but equals that of similar beams of freshly cut, air-seasoned Douglas fir. Age does not seem to intensify the weakness due to defects.

When tested under impact loading in beams of clear material free from defects, Douglas fir after long use is only about 86 per cent as strong at the elastic limit as freshly cut Douglas fir of the same moisture content, but is 95 per cent as strong as freshly cut Douglas fir containing 20 per cent of moisture, a condition which approximates "air-seasoned" on the market. Long use renders Douglas fir wood fiber slightly less resistant to suddenly applied loading. The longitudinal shearing strength of Douglas fir after long use averaged as follows: 1,520 lbs. per square inch for shearing areas of about 6 sq. in. in clear material; 960 lbs. per square inch for shearing areas larger than 40 sq. in. in rectangular blocks containing defects, principally knots; and 290 lbs. per square inch in large beams which contained knots and checks. Therefore, working stresses for longitudinal shear must be based on the results of tests of specimens similar in character to the details of the timber structure to be designed.

Strength and other properties of wire rope, J. H. GRIFFITH and J. G. BRAGG (*U. S. Dept. Com., Bur. Standards Technol. Paper 121* (*1919*), *pp. 80, pls. 2, figs. 11*).—This paper presents the results of tests of 275 wire ropes of American manufacture, which ranged in diameter from ¼ in. to 1½ in. and a few being of larger diameters up to 3½ in. Over half the specimens were plow and crucible-cast steel hoisting rope of 6 and 8 strands of 19 wires each. The remainder were guy and tiller ropes of 6 strands of 7 wires and 6 strands of 42 wires each.

The linear dimensions of the wires, strands, and rope cores were found from measurements to be proportional to the diameters of the cables. The diameters of strands and rope cores were generally one-third the diameters of the cable, the cores of the 8 by 19 plow-steel rope being slightly larger. The mean pitch or lay of a strand was approximately 7½ times the diameter of the cable. The mean lay of the wires was approximately 2¾ times the diameter of the cable. The mean diameters of the wires are given approximately by the following equation:

$$d=K\frac{D}{N+3}$$

In this, d=diameter of wires; D=diameter of cable; N=number of wires in outer ring of strand; and K=1.0 for hoisting and guy rope, 0.8 for flexible hoisting rope, and 0.83 for tiller rope.

The mean aggregate sectional area of the wires in a cable in terms of its diameter is given approximately by the following formula:

$$A=CD^2$$

In this, C=0.41 for 6 by 19 plow-steel rope, 0.38 for 6 by 19 crucible cast-steel rope, 0.38 for 6 by 7 guy rope, 0.35 for 8 by 19 plow-steel rope, and 0.26 for 6 by 42 iron tiller rope.

The sectional area of the steel in a cable in terms of the mean area of its wires is given by the following formula:

$$A=S[3n(n-1)+1]a.$$

In this, A=area of steel; S=number of strands; n=number of concentric rings; and a=mean area of a wire.

It was found when the observed maximum loads were platted as functions of the diameters of the cables of each class that the lower boundary of the field comprising these observations could be expressed within fairly close limits by the following formula:

$$\text{Load}=C\ 75{,}000\ D^2.$$

In this, D=diameter of cable, and

$$C\left\{\begin{array}{l}=0.9\text{ to }1.10;\text{ mean about }1.00\text{—plow steel 6 by 19 cables.}\\ =.8\text{ to }1.00;\text{ mean about }.85\text{—}\left\{\begin{array}{l}\text{plow steel 8 by 19 cables.}\\ \text{crucible-cast steel 6 by 19 cables.}\end{array}\right.\\ =.3\text{ to }.45;\text{ mean about }.35\text{—}\left\{\begin{array}{l}\text{tiller rope 6 by 42 cables.}\\ \text{guy rope 6 by 7 cables.}\end{array}\right.\end{array}\right.$$

The specifications and the standard strengths of the manufacturers were found in general to agree quite closely with the loads defined by these lower boundaries. The arithmetical means of the observed maximum loads from the tests were usually about 5 to 12 per cent higher than the minimum values recorded, depending upon the particular grade of steel used by the manufacturer in meeting the requirements of the specifications. The mean values of the observed maximum stresses found for the different classes of cables, when platted in curves, showed a general correspondence with similar curves platted from stresses figured from the maximum loads given by the specifications and the standard strengths of the manufacturers. The smooth curves following the general trend of the platted observations were of the type found in tests of wires of different diameters. The relatively high maximum stresses found for small cables were attributed to the greater strengths of the wires as a result of wire drawing. The observed unit elongations under cumulative stresses showed some irregularities for different cables of the same class and diameter. The elongations were nearly proportional to the stresses in a particular cable. The calculated moduli of the cables varied from 8 by 10^6 to 9 by 10^6 lbs. per square inch of cable section. While this is increased by service, it is believed the limit of 12,000,000 lbs. per square inch used in the calculation of bending stresses is ample.

The tensile strengths of wires in a strand were quite uniform. The maximum elongations were relatively high, considering the strength of the wires. The strengths of wires in cables of the same class and diameter were quite uniform when the steel was of the same grade. The fiber used for rope cores in the hoisting cable of 1¼ and 1½ in. diameter was estimated to be manila, jute, or istle. In some cases mauritius had been mixed with the istle. Manila fiber is considered to be the most efficient for power transmission and hoisting cables, on account of its greater strength and ability to resist alternate bending. "The efficiency of a cable in developing the strength of the wires depends theoretically upon the construction and lays of the strands and wires. The effective component along the cable axis was found to be about 89 per cent of the working stress in the wires for 6 by 19 plow-steel cables. The mean component developed at rupture was found to be about 8 per cent less than the theoretical value computed on the basis of an elastic behavior of the material."

The Centerville tractor demonstration and test, H. H. MUSSELMAN (*Michigan Sta. Quart. Bul., 2 (1919), No. 2, pp. 86, 87*).—Tests of 11 different tractors on sand to sand loam soil with stubble and very light sod surface are reported. In all cases except one, 14-in. plows with either two or three bottoms were used.

It was found that the average cost of plowing at a depth of 8 in. was approximately 55 cts. per acre for fuel. An average of more than three-fourths of an acre was plowed per hour. The rated horsepower of the tractors varied from 8–16 to 12–25. Belt tests showed in a general way that these tractors will assert their rated horsepower when new and in good adjustment, but that there is not so great a margin of power above the rated figures as is sometimes indicated by the tractor at work.

Official tractor tests made in Ohio (*Farm Machinery, No. 1452–53 (1919), pp. 11, 12, figs. 2*).—This report summarizes the results of four different plowing tests of 28 tractors of 24 makes, conducted in Ohio under the auspices of the Ohio State University, including dynamometer tests. The plowing was 8.5 in. deep on dry, sandy loam containing hidden rocks; heavy, dry loam containing hidden rocks; wet, sandy loam with hard, dry subsoil; and hard, dry, clay loam with heavy subsoil. The speed of plowing varied from 1.25 to 3.66 miles per hour. The greatest depth of plowing, 10.25 in., was done at a speed of 3.08 miles per hour with a drawbar pull of 3.220 lbs. by a 30-horsepower, 2-cylinder tractor, weighing 5,100 lbs. and pulling three 14-in. plow bottoms.

Agricultural tractor trials in France (*Impl. and Mach. Rev., 45 (1919), No. 529, pp. 71–77, figs. 12*).—This is a brief report of recent tractor trials at Saint-Germain, France, in which the work of the different machines is described.

Motor tractor trials (*Jour. Dept. Agr. Victoria, 16 (1918), No. 12, pp. 727–734*).—Data on field plowing, dynamometer, and fuel consumption tests and normal and maximum load tests in the laboratory for eight different tractors are reported.

The lowest fuel consumption per acre plowed was obtained with a tractor weighing 6,521 lbs. with horizontal, single-cylinder, 2-stroke cycle engine, rated at 14 brake horsepower, plowing 4.5 in. deep with a disk plow. The greatest fuel consumption per acre plowed was with a tractor with vertical, 2-cylinder, 4-stroke cycle engine of 24 rated brake horsepower, plowing 4.5 in. deep with a moldboard plow. Dynamometer tests showed that these two tractors gave the highest and lowest average and maximum drawbar pulls in pounds, respectively.

Winners in chain drive contest (*Farm Machinery, No. 1454–55 (1919), p. 14*).—Important points brought out by a chain drive tractor performance contest were that tractors equipped with chain drive are being used with highly satisfactory results and with remarkable constancy in operation. Repairs to chains were rare; where necessary they were usually due to natural wear, and in cases of breakdowns permanent repairs were made quickly and cheaply.

The conservation of motor fuel as affected by lubricating oil, S. F. LENTZ (*N. G. E. A. Bul., 3 (1918), No. 11, pp. 20–27*).—The author defines and discusses those qualities of lubricating oil which directly affect economy in fuel consumption in internal combustion engines.

It is shown that viscosity plays the most important part, but that the manner by which the oil obtains its viscosity must be considered. "A general rule, safe to follow, is that an oil which has the proper body and which can be redistilled with little change in physical characteristics will give best results in an internal combustion motor."

Actual situation of mechanical cultivation (*Dir. Gén. Agr., Com., et Colon. [Tunis] Bul., 21 (1917), No. 91, pp. 69–130*).—This is an extensive review of the mechanical cultivation situation, in which numerous tractor plowing tests are summarized and the conditions underlying the selection of mechanical cultivating apparatus for Tunisian conditions are discussed in some detail.

The hydraulic ram, W. S. H. Cleghorne (*So. African Jour. Indus., 2 (1919), No. 2, pp. 135–142, figs. 6*).—This article deals with the design, operation, and installation of hydraulic rams.

Silos, A. Fontana (*Rev. Agr., Com., y Trab. [Cuba], 1 (1918), No. 3, pp. 142–147, figs. 6*).—Information on the planning and construction of silos with special reference to Cuban conditions is given.

Silo for ensilage or grain, J. Wilson (*Jour. Dept. Agr. Victoria, 16 (1918), No. 4, pp. 228–235, figs. 6*).—Plans and specifications are given for a 100-ton, all-wood, stave silo.

Construction and fire protection of cotton warehouses, J. M. Workman (*U. S. Dept. Agr. Bul. 801 (1919), pp. 79, pls. 43, figs. 6*).—This bulletin deals in some detail with matters relating to the construction and fire protection of cotton warehouses, giving definite suggestions based on what are considered desirable principles and practice. The recommendations as to construction correspond with the building code recommended by the National Board of Fire Underwriters. The important points taken up are fire-resistive construction, slow-burning and semislow-burning construction, frame and iron-clad construction, auxiliary structures, and fire-protective equipment.

Considerable information on selection of warehouse design and precautions against fire are given and an appendix of seven standard warehouse plans is included. It is stated that the site for the plant should be considered with reference to transportation facilities, area available, topography, soil, and water supply, and that no warehouse should, as a rule, be built unless it can be provided with a sufficient water supply for reasonable fire service. The design of warehouse buildings should be selected with a view to the cost of construction, maintenance, and operation on the one hand, and resulting fire hazard and insurance rates on the other.

How to make a hog crate (*U. S. Dept. Agr., Dept. Circ. 46 (1919), pp. 2, fig. 1*).—A hog crate for shipping hogs is briefly described and illustrated.

RURAL ECONOMICS.

International yearbook of agricultural legislation (*Inst. Internatl. Agr. [Rome], Ann. Internatl. Lég. Agr., 8 (1918), pp. LVII+1198*).—In this is published the text of the more important legislation of 1918 and titles of the other laws and decrees, continuing the information previously noted (E. S. R., 40, p. 890).

American Association for Agricultural Legislation, R. T. Ely (*Jour. Farm Econ., 1 (1919), No. 3, pp. 109–114*).—This paper briefly presents the function of this body as being the gathering together and rendering available for specific and definite purposes knowledge which has already been gained, but which is general and scattered, and its field for investigation as including questions of legislation on food production, consumption, and price, and problems of land settlement, credit reforms, marketing organisations, rural life, and others.

[Laws relating to the Department of Agriculture in Nebraska] (*Nebr. Dept. Agr. Bul. 1 (1919), pp. VII+93*).—The text of laws setting forth the powers and duties of the Nebraska Department of Agriculture in respect to crops, live stock, and commercial preparation and distribution of foods is given here.

Land settlement (*Min. Reconstr.* [*Gt. Brit.*], *Reconstr. Prob. No. 20* (*1919*), *pp. 16*).—The purpose of this pamphlet is to indicate the position of agriculture in Great Britain, considering briefly the area and character of cultivated land in the United Kingdom, the number of agricultural holdings, and the agricultural population.

It outlines also the Government policy regarding land settlement by agricultural laborers and town workers, the establishment of State funds, the providing of small holdings, and the training of ex-service men; as well as the facilities for carrying out a proposed program including the dissemination of information, short-term credit, the supply of agricultural machinery, the promotion of supplementary rural occupations, the reconstruction of rural life, and a system of rural transport.

The land question solved! H. A. DAY (*London: Methuen & Co., Ltd.*, [*1919*], *pp. X+92*).—Arguments for land nationalization for England are presented here, the discussion covering the impotence of party politics, how to solve the problem, how the land is to be obtained, land finance, land and market organization, the place of the allotment in the land question, unfit and fit men for the land, the churches and the land, cooperation, rural housing, and rural industries.

Encouraging repopulation and combating the high cost of living, A. KRUG (*Pour. la Repopulation et contre la Vie Chère. Paris: Berger-Levrault, 1918, pp. XII+304*).—This is a discussion of individual and governmental responsibility for raising the birth rate of France, repopulating rural districts, and encouraging agriculture by means of higher education, use of power for cultivation of the land, and the alliance of financial and industrial interests with agriculture.

[Projects of the department of agricultural economics of the Wisconsin Experiment Station] (*Wisconsin Sta. Bul. 302* (*1919*), *pp. 36–38, fig. 1*).—These pages report briefly the results of studies of farm labor conditions, of farmers' labor income surveys, and of milk marketing studies.

Farmers' union and federation advocate and guide, W. H. KERR (*Topeka, Kans.: Crane & Co., 1919, pp. 172*).—This book advocates a minimum price system for all farm products, especially wheat, cotton, corn, cattle, and hogs, to be based on skilled union wages and overhead expenses, and enforced by concerted nondelivery, if necessary.

Farmers' cooperation in Minnesota, J. D. BLACK and F. ROBOTKA (*Minnesota Sta. Bul. 184* (*1919*), *pp. 5–62, figs. 3*).—The plan and content of this bulletin includes a list of some of the essentials of successful cooperation, and tables showing the increase, comparisons between the amount of business carried on, disposition of surplus, and dividends paid on capital stock for several forms of cooperation. Three of the more important essentials to successful cooperation are found to be a sound economic need for a cooperative company, enough business, and a cooperative spirit. It notes also the prospects for cooperative farmers' markets in Minnesota, and the text of the laws of Minnesota affecting cooperation is also given.

It is indicated that most of the gain of 950 in the number of cooperative organizations of all kinds is a real gain. The important gains are those for live stock shipping associations, elevators, and creameries. The increase in miscellaneous organizations is largely because 100 buying clubs and 75 horse-breeding associations are included, many of which were probably in existence in 1913 but not counted. The real gain for the four years is therefore about 450, or 800 if farmers' telephone companies are included. The increase in annual volume of business from $58,260,000 to $118,110,000 is said to be due in large part to the rise in prices.

Minnesota leads all other States in the number of cooperative companies, reporting 2,950 in 1918, and it is predicted that this lead will be retained.

German agricultural cooperative societies during the war, Johannsen (*Better Business, 5 (1919), No. 1, pp. 65–72*).—This is a translation of a portion of an article by the author, published in 1918, on the aims of German agriculture after the war. Brief mention is made of the vicissitudes, participation in war loans, and other activities of several types of agricultural cooperative societies in Germany.

Modern grain exchanges, J. G. McHugh (*Coop. Manager and Farmer, 9 (1920), No. 5, pp. 35–66, figs. 78*).—In these pages are published a series of illustrated articles, with reference to (1) the nature and functions of a grain exchange; (2) the flour mills of Minneapolis; (3) the linseed oil industry; (4) the Minneapolis terminal elevator operators; (5) the grain commission merchant; (6) future trading, hedging, and speculation in grain exchanges; and (7) the Minnesota State inspection, weighing, and sampling departments.

A system of bookkeeping for grain elevators, B. B. Mason, F. Robotka and A. V. Swarthout (*U. S. Dept. Agr. Bul. 811 (1919), pp. 53, fig. 1*).—This is a revision of Bulletin 362 previously noted (E. S. R., 35, p. 296), incorporating features suggested by the practical operation of the earlier system during three and one-half years.

Farmers' Market Bulletin (*North Carolina Sta., Farmers' Market Bul., 6 (1919), No. 30, pp. 12*).—The current list of products which farmers have for sale is published, together with a brief note by W. R. Camp regarding the sale of farm products through warehouses of the State warehouse system.

[Agricultural conditions on the Belle Fourche reclamation project in 1918], B. Aune (*U. S. Dept. Agr., Dept. Circ. 60 (1919), pp. 5–8, fig. 1*).—Data are presented according to the plan previously noted (E. S. R., 40, p. 391).

Alfalfa was the principal crop and has shown an increase in acreage, the total area planted in 1918 being 20,467 acres, or 39 per cent of the actual irrigable land. Barley, corn, and oats showed slight decreases, while the acreage in wheat in 1918 was very nearly double the 1917 crop. Average yields per acre have remained low. Farm values of all crops in 1917 and 1918 were practically doubled.

The principal live-stock industries showed a slight decrease in 1918, except dairy cattle. The total number of carloads of live stock shipped from the four project towns in 1918 was 1,406; 487 carloads less than in 1917. During the same period 240 cars were received, showing an increase of 87 carloads.

Agriculture in Alsace Lorraine, H. and J. Hitier (*Expansion Econ., 3 (1919), No. 7, pp. 27–45*).—This is a review of important crops grown, with details of viticulture and the competition which threatens to develop between the industry in this region and in southern France, the numbers of live stock, extent of forests, and the value to French agriculture of the potash mines.

Agriculture in Cyrenaica, G. Monti (*Italia Agr. 56 (1919), No. 11, pp. 325–336, figs. 5*).—An account is given of the climate and general agricultural conditions of this Italian territory in northern Africa, and of research under military auspices regarding the influence of depth of soil, water, and of the time of sowing upon the crop, and the potential productivity of the soil to show the possibilities of this region as a source of grain supply for Italy.

[Agricultural statistics of Egypt] (*Ann. Statis. Egypte, 10 (1918), pp. 56–109, pl. 1*).—These pages continue for 1918 information noted for earlier years (E. S. R., 33, p. 395).

Report of colonization, agriculture, and the live-stock industry of Japanese Sakhalin and of the Dutch East Indies, M. Müller (*Einiges über Kolonisation, Ackerbau und Viehzucht auf Japanisch-Sachalin und Niederländisch-Indien. Leipzig: Reichenbach'sche Verlagsbuchhandl.*, [*1918*], *pp. 17, fig. 1*).—In this, one of the series of publications of the Economic Society of Saxony, the author describes the natural resources and climate of the island of Sakhalin and the attempts of the Japanese Government to encourage permanent colonization and the development of agriculture there. With this, which he considers a futile effort on the part of the Japanese, he contrasts the success of Holland in colonizing Java and Madura.

Index numbers of Indian prices, 1861–1918, G. F. Shirras (*Dept. Statis., India, Index Nos. Indian Prices, 1861–1918, pp.* [*IV*]+*24, pls. 5*).—This volume contains general and summary tables showing index numbers of prices from 1861 to 1918, the figure for 1873 being taken as the standard or base. One summary table shows unweighted index numbers of retail prices of food grains in India, and another the percentage of increase or decrease for each year compared with those of the preceding year.

As regards the level in prices in 1918, it is generally stated that there was a rise of 125 per cent in the average level as compared with the standard period (1873), the rise being 189 per cent in the articles of import and 99 per cent in those of export. From a summary table showing the unweighted index numbers of the average price of the main groups of articles as compared with 1913, it is seen that there was an increase of 43 per cent in "food and drink." Index numbers on the basis of the average price during the first half of 1919 show that the greatest rise, 102 per cent, was in this group, due chiefly to the increase in price of food grains, which advanced by 110 per cent as compared with 1913.

AGRICULTURAL EDUCATION.

Improvement of instruction in colleges of agriculture, G. A. Works, W. G. Hummel, W. H. French, M. L. Hayes, and R. D. Maltby (*Fed. Bd. Vocat. Ed., Vocat. Summary, 2* (*1919*), *Nos. 7, p. 126; 8, pp. 140, 146*).—This is the report of the standing committee on improvement of agricultural instruction in institutions which train teachers of the American Association for the Advancement of Agricultural Teaching, submitted at its annual meeting November 11, 1919.

The committee recommends that in each department of a college of agriculture there should be a basic course that will give the student a fundamental knowledge of the department's field of work. This would make it possible for a student to get the breadth of preparation that his work as a teacher demands, and at the same time permit him to specialize to the extent of from 12 to 18 semester hours beyond the basic course in some one department. This degree of specialization would enable the student to learn something of the methods of investigation in that field, and would also make it possible frequently to adjust the teacher to the demands of the agriculture of the community in which he serves.

Considering the question of these basic courses from the standpoint of other members of the student body, the arguments that have been advanced in the case of teachers of vocational agriculture are deemed valid in all essential features so far as county agents are concerned. Experience shows that most of the farming group desire only a moderate degree of specialization, but they do demand a real knowledge in several phases of agriculture that will assist them in meeting the demands that come to them as farmers without having had to specialize. The remainder of the students, or the specialist group, who may desire to specialize rather highly, should have an opportunity to secure general courses in several other departments than the one in which they are specializing.

It is suggested that the basic courses may occur either as an introduction to other courses, or the work of the department may be organized with specialized courses for the student who desires to major in the field of the department's interests, and with an additional fundamental course for those who are not specializing in the department. In the smaller institutions the limited number of students would preclude the second plan.

The future of higher forestry instruction in Prussia, A. Möller (*Ztschr. Forst u. Jagdw., 51 (1919), No. 7, pp. 353–400*).—The author offers this discussion as a basis for proposed projects for the reorganization of higher forestry instruction in Prussia either by closing the Forest Academy at Eberswalde and transferring its instruction to the university or by reorganizing the academy into a fully developed forestry high school. Either of these procedures, in the author's opinion, would require the discontinuance of the Forest Academy at Münden, since one institution is deemed sufficient to meet the needs for higher forestry instruction in Prussia.

Report of the work of the Ultuna Agricultural Institute, Agricultural School and farm, 1918 (*Red. Ultuna Landtbr. Inst.* [*Sweden*], *1918, pp. IV+128, pl. 1, figs. 29*).—A report on the organization, instruction, experimental work, and finances of the institute, school, and farm for the year.

High schools and trade areas closely related (*Wisconsin Sta. Bul. 302 (1919), p. 38*).—As the result of specific studies by C. S. Galpin, it is shown that seven-eighths of the entire area of Wisconsin is outside of any existing high school district; also, that if the high school district were extended so as to cover the area from which its rural students come, it would practically coincide with the trade area of the village or city in which the high school is situated. The elementary school district map indicates that the particular group of country school districts around each village or city practically coincides with the village trade area, and therefore with the possible extension of the enlarged high school district. From this it is concluded that if a closer relation existed between the country schools and their near-by high school, which in the main has been regarded as an urban institution, a larger proportion of country boys and girls would attend the village or city high school. "A positive force would then enter rural life, cementing more securely the increasingly cordial relations of farmers and townsmen."

Plans of Massachusetts for year 1919–20 (*Bul. Bd. Ed. Mass., No. 4 (1919), pp. 109, figs. 4*).—This is an outline of the plan for vocational education in Massachusetts for 1919–20.

The tentative plan for teacher training submitted last year has been in effect, with the exception of the institutional training which was delayed because of conditions arising out of the war, and has been more fully developed this year. It comprises (1) regular four-year undergraduate courses leading to the B. S. degree and a diploma from the Massachusetts Agricultural College; (2) a course not to exceed two years and leading to a certificate, for an unclassified group consisting of mature persons of superior general intelligence and of approved farm experience who declare their intention to teach agriculture in the vocational schools or departments of Massachusetts, and who are admitted, when necessary, to regular college classes as teachers in training;

and (3) short winter courses of 10 weeks and summer courses of 4 weeks (to be extended to 6 weeks next year) for miscellaneous improvement and emergency training.

Itinerant teacher training, largely individual, by the State agent, will also be given to assist employed teachers either in routine methods or in more organized professional improvement programs. The State agent will also conduct teacher-training classes at convenient centers for groups which may profit by uniform or class instruction. These will probably occur more frequently at the county schools. At the agricultural college in July and January there is a 2-weeks' intensive course (of about 80 hours) of special methods problems primarily for employed teachers, which is extended to 4 weeks for candidates.

In the entrance requirements to the degree course, agriculture will be accepted from vocational agricultural schools for not to exceed 4 of the 5½ elective units. Each employed teacher is expected to undertake and pursue an improvement program or project. The work may be pedagogy, agricultural subject matter, community service, or agricultural practice, and will be determined by his needs. In addition, the department of agricultural education will arrange for apprentice teaching by strong candidates, for a period of one college term for each candidate, in selected vocational schools and departments in cooperation with the State Board for Vocational Education.

Certain plans for training homemaking teachers are carried out in nine State-aided household arts schools. A proposed plan for the establishment, at the State Normal School at Framingham, of a course for training teachers of household arts for vocational schools is presented. The tentative 3-year course, which is later to be extended to 4 years, is outlined. All home economics teachers in service must do some approved professional improvement work each year to be carried out in cooperation with the directors of schools.

Report of the State Board of Regents and State Vocational Board of West Virginia for the two years ending June 30, 1918 ([*Bien.*] *Rpt. State Bd. Regents and State Vocat. Bd. W. Va., 1917–18, pp. 51–107*).—Part 2 of this report consists of the report of the State Vocational Board of West Virginia for 1917–18, the first annual report of the State director of vocational agriculture for the year ended June 30, 1918, and the plan of work for vocational education, 1918–19.

It is stated that for three or four years agriculture has been taught in approximately 50 per cent of the secondary schools of the State. These courses, mostly 1 year in length, however, are primarily courses in book agriculture, and definite courses in vocational agriculture in the high school were first established in the year under report. During the year 8 high-school departments and 8 evening classes qualified for Federal aid for vocational agriculture. The subject of agriculture was pursued in the high schools by 1,466 students, household science by 2,375 students, and household art by 1,797 students.

The West Virginia University was designated for the training of vocational teachers enrolled in the College of Agriculture and for the improvement of teachers already in service. The 4-year teacher-training course in agriculture is outlined. Of the 144 semester hours necessary for graduation, 104 are prescribed. As a rule the courses are distributed as follows: Agriculture 40 per cent, sciences 30 per cent, humanistic 20 per cent, and professional 10 per cent. The vocational agricultural department in the local high school is used for observation and practice teaching. The plans for 1918–19 provide that 25 per cent of the teacher-training fund be used for agricultural subjects, 25 per cent for home economics subjects, and 30 per cent for supervision and maintenance.

The 4-year teacher-training course in home economics is outlined. It requires 128 semester hours for completion. Each student will teach at least 15 lessons during the senior year. For graduation it is required that all students shall have lived in the demonstration home, or in case of students living in town its equivalent will be planned by means of an apartment.

Suggestions for the teaching of home economics in high schools of Mississippi, G. Teague (*Miss. Dept. Pub. Ed. Bul. 14* (*1919*), *pp. 68, pl. 1*).—This bulletin contains a detailed discussion of the content and method of presenting the three units of home economics required for graduation from the high schools of Mississippi, and to be given in the first, second, and fourth years.

A unit consists of 36 weeks or 180 lessons during each of the three years. The first two years of the course may also be used in the consolidated schools. The subjects of the course are as follows: Foods—food study and cooking, housewifery, gardening, dairying, poultry, child care and home nursing, and household management; clothing—selection, care, cost, etc., textiles and laundering, sewing, renovation, mending, darning, and patching; and art—drawing and design, the home, and costume design. Guiding principles of education in the teaching of home enonomics and in making lesson plans, as well as suggested illustrative material and references to literature, are included.

Home economics under the Smith-Hughes Act, L. G. Turner (*Nashville, Tenn.: Dept. Pub. Instr.*, *1919*, *pp.* 8).—This bulletin outlines the requirements in vocational home economics instruction in Tennessee under the Smith-Hughes Act. Suggested type courses for a six-hour or a five-hour school day, and a course in foods for part-time classes are outlined.

Cooperative extension work in agriculture and home economics, 1918 (*U. S. Dept. Agr.*, [*Rpt.*] *Coop. Ext. Work Agr. and Home Econ.*, *1918*, *pp. 158*, *figs. 6*).—This is the fourth annual report on the receipts, expenditures, and results of cooperative agricultural and home economics extension work under the Agricultural Extension Act of 1914, comprising a brief summary (pp. 15–22), Extension Work in the South (pp. 23–71), Extension Work in the North and West (pp. 73–123), Farmers' Institutes in the United States (pp. 125, 126), by J. M. Stedman, and statistics (pp. 127–158).

A compendium of agriculture, C. Seltensperger (*Précis d'Agriculture. Paris: J. B. Baillière & Sons*, *1919*, *3. ed.*, *pp. VIII+538*, *figs. 425*).—This is a revised and enlarged edition of the text previously noted (E. S. R., 21, p. 91). A statement is included of the facilities for agricultural instruction and research in France. Sections on the production of apples for cider and cider making, pisciculture, and sericulture have been added.

How teachers may use publications on the control of diseases and insect enemies of the home garden, A. Dille (*U. S. Dept. Agr.*, *Dept. Circ. 68* (*1919*), *pp. 4*).—Brief suggestions are given.

How teachers may use Farmers' Bulletin 876, Making Butter on the Farm, E. H. Shinn (*U. S. Dept. Agr.*, *Dept. Circ. 69* (*1919*), *pp. 4*).—Brief suggestions are given for the use of Farmers' Bulletin 876 (E. S. R., 38, p. 480).

MISCELLANEOUS.

The work of the Belle Fourche reclamation project experiment farm in 1918, B. Aune (*U. S. Dept. Agr.*, *Dept. Circ. 60* (*1919*), *pp. 34*, *figs. 5*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-first Annual Report of Massachusetts Station, 1918 (*Massachusetts Sta. Rpt.*, *1918*, *pts. 1–2*, *pp. 56a+274*, *pls. 3*, *figs. 21*).—This contains the organization list, reports of the acting director and heads of departments, a financial statement for the fiscal year ended June 30, 1918, and reprints of Bulletins 182–188, previously noted. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Service to Wisconsin: Annual report of the director of the experiment station for 1916–17 and 1917–18, H. L. Russell and F. B. Morrison (*Wisconsin Sta. Bul. 302* (*1919*), *pp. 71, figs. 25*).—This contains the organization list, an account of the activities of the station, brief summaries of the station publications for the biennium, and financial statements as to the Federal funds for the years ended June 30, 1917, and June 30, 1918. The experimental features not previously reported are for the most part abstracted elsewhere in this issue.

Quarterly bulletin of the Michigan Experiment Station (*Michigan Sta. Quart. Bul., 2* (*1919*), *No. 2, pp. 102, figs. 18*).—In addition to articles abstracted elsewhere in this issue, this number contains the following: Cost of Farm Products; Records of Dairy Production; Cost of Pork Production; The College Herefords, by G. A. Brown; Silage Inoculation, by Z. N. Wyant; The Bull as a Carrier of Abortion Disease, by H. J. Stafseth; Water Questionnaire, by W. Giltner; Cooling Milk at the Farm, by L. H. Cooledge; Botanical Department Notes, by G. H. Coons; Suggestions for Handling Cows on Yearly Tests, by J. E. Burnett; Alfalfa Dependable if Rightly Handled, by J. F. Cox; Shall the Maple Sirup Maker Disappear from Michigan? by F. H. Sanford; Horticultural Notes, by C. P. Halligan; and Constitutional Vigor, by C. H. Burgess.

Monthly Bulletin of the Ohio Agricultural Experiment Station (*Mo. Bul. Ohio Sta., 4* (*1919*), *No. 9, pp. 267–295, figs. 8*).—This number contains, in addition to several articles abstracted elsewhere in this issue, Selection of Rations for Egg Production, by W. J. Buss, and Autumn Planting of Hardy Perennials, by W. E. Bontrager.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta. Mo. Bul., 7* (*1919*), *No. 9, pp. 133–152, figs. 10*).—This number contains brief articles on the following subjects: Red Raspberries in Western Washington, by J. L. Stahl; Concerning the Purchase of Fertilizers, by E. B. Stookey; The Rhizoctonia Disease, by A. Frank; Nasal Catarrh or Colds in Poultry, by W. T. Johnson; and Farm Publicity, by L. E. Carter.

NOTES.

California University and Station.—G. R. Stewart, assistant professor of agricultural chemistry, has resigned to become chemist for the Hawaii Sugar Planters' Station. W. C. Dean has resigned as instructor in soils to engage in commercial work. W. A. McCutchan has been appointed assistant in pomology.

Delaware Station.—H. T. King, chemist, and S. Skorglund, assistant chemist, have resigned to engage in commercial work, their resignations being effective March 1 and February 15, respectively.

Georgia Station.—F. H. Smith, assistant chemist, has been appointed head of the department of chemistry, and T. S. Buie, assistant agronomist, head of the department of agronomy.

Illinois University and Station.—H. W. Mumford, chief of the department of animal husbandry, has been granted leave of absence to become director of the live stock marketing department of the Illinois Agricultural Association. It is announced that this association has a membership of over 55,000 and an annual budget of $333,000, of which $75,000 is available for the live stock marketing department. The special field of this department is to study market conditions and facilities as applicable to Illinois conditions.

Massachusetts Station.—Sidney B. Haskell, head of the department of agronomy in the college from 1911 to 1916 and subsequently connected with the Soil Improvement Committee of the National Fertilizer Association, has been appointed director of the station beginning July 1.

Missouri University and Station.—The college of agriculture has organized a department of rural life, in which are grouped the subjects of rural economics, rural sociology, and farm management. The present staff comprises O. R. Johnson and R. M. Green in farm management, S. D. Gromer in rural economics, C. C. Taylor in rural sociology, Ralph Loomis in extension work in rural organization, and W. E. Foard in extension work in farm management.

The department of animal husbandry has rented a farm near the university campus comprising 330 acres. This farm will be used for maintaining the live stock equipment of the department and for investigations in live stock management.

R. R. Hudelson, associate professor of soils, and E. M. McDonald, assistant professor of farm crops, have resigned to engage in farming in Alberta. Recent appointments include Dr. Albert G. Hogan as professor of animal nutrition in the college and station, beginning September 1; Dr. E. F. Hopkins of the Alabama College and Station, as assistant professor of botany and plant pathologist, mainly for research work; and F. E. Bradford as assistant professor of horticulture.

States Relations Service.—In the Office of Extension Work in the South, J. A. Evans has been appointed chief vice Bradford Knapp, whose resignation has been previously noted. W. B. Mercier has been appointed assistant chief. For inspection and general supervisory work, the territory will be divided among three agriculturists and field agents viz., I. O. Schaub for Virginia, North Carolina, Tennessee, Arkansas, and Louisiana; E. A. Miller for Oklahoma, Texas, Maryland, West Virginia, and Kentucky; and H. E. Savely for Alabama, Florida, Georgia, Mississippi, and South Carolina.

J. D. Luckett, specialist in field crops on the editorial staff of *Experiment Station Record*, has been appointed editor and librarian of the New York State Station and entered upon his new duties March 1.

Ontario Agricultural College.—Building plans interrupted by the war are now being resumed, and three new buildings are in course of construction. One of these is a dormitory for which ground was broken in July, 1914, but immediately postponed on the outbreak of hostilities. This is a 3-story limestone building accommodating about 175 students, and will cost about $150,000. Another is a 2-story and basement apicultural building about 65 by 47 ft., and costing about $40,000. This building will contain laboratories and classrooms, and the basement will be specially insulated for wintering bees.

A new piggery is almost completed at a cost of about $8,500. This is a structure 120 by 30 ft., mainly of concrete, and containing steel partitions and troughs, litter carriers, and other conveniences.

Agricultural Work of the American Presbyterian Mission at Nanhsuchou, Anhwei, China.—A communication recently received from J. Lossing Buck, agriculturist in charge, gives many interesting details concerning the development of agricultural work at this mission since an earlier note (E. S. R., 36, p. 799).

It is stated that in November, 1918, the first agricultural class in the over four thousand years of history of Nanhsuchou was held for some of the more interested landowners of the locality. Twelve men registered in the class, and there was an average attendance of nine throughout the course, which was given for one hour per day for a two months' period. One of the principal drawbacks encountered was the lack of available books in Chinese on general agriculture, but none-the-less much interest was manifested.

One subsequent development was the formation of a local agricultural society and more recently of an agricultural club, the latter being composed of former members of the class. The club is intended for the discussion of local agricultural topics, and among the subjects taken up have been The Improving of the Fruit Industry, The Improving and Enlarging of the Poultry Industry (discussed because of the great demand for eggs by the egg-drying factories of this and other places), and What Can a Farmer do During the Winter Months Besides Idling Away His Time and Gambling Away His Money?

An agricultural short course is projected for farmers who can read. These farmers are not numerous, but owing largely to the recommendations of last year's class 10 men have applied for the course, for which a maximum of 20 has been set.

One former student, who comes from the landlord class, has taken some of his land back from his tenants for personal operation. He is also conducting a cooperative fertilizer test with wheat, thus duplicating a test under way at the mission. Together with another member of the class, he has planted a considerable quantity of locust seed with a view to starting a farm woodlot, and is cooperating in testing new grains and grasses for the region.

Extension work, as elsewhere in the Chinese missions, is seriously handicapped by the lack of properly trained native assistants and the need of experimental work to ascertain the best farm practices. The mission has, however, a considerable amount of variety testing under way, including 63 varieties of wheat from widely separated regions in China, as well as Japan and America, 8 varieties of American and 46 strains of Chinese barley, 20 varieties of beans, 18 of sesame, 8 of cotton, 5 of maize, and 8 of grapes. There are also fertilizer tests with wheat, selection studies with wheat, barley, and sesame, and cultural tests with wheat, cotton, Australian saltbush, sweet potatoes, alfalfa, and various foreign vegetables. A difference in yield of wheat varieties of 18 bu.

per acre has been noted. In the cotton work, which is in cooperation with the Nanking College of Agriculture, the most promising results have been obtained with the Trice variety. Spring barley has been found well adapted to lowlands too wet to be plowed in the fall.

The amount of agricultural work has been limited by the supervision required in building a farmhouse, the lack of trained labor, and the shortage of funds for farm operations, purchase of land, and especially farm machinery. Nevertheless Mr. Buck is enthusiastic over the opportunity presented for constructive agricultural advancement in the region.

American Meteorological Society.—The initial number of the *Bulletin of the American Meteorological Society*, now being issued monthly by the society, contains an announcement regarding the organization of the society December 29, 1919; the text of the constitution and by-laws adopted, and officers and councilors elected; the committees chosen to have charge of and report upon various activities of the society; an annotated bibliography of the papers presented at the St. Louis and New York meetings, December 30 and 31, 1919, and January 3, 1920, respectively; contents of the November, 1919, number of the *Monthly Weather Review;* and statements regarding some of the proposed U. S. Weather Bureau projects; besides miscellaneous news items, notes, and queries of meteorological interest.

Eleven committees have been named by the society, four to deal with the advancement and diffusion of knowledge of meteorology, and seven with the development of the numerous applications of meteorology to human affairs. The committees and their chairmen are as follows: Research, C. F. Marvin; meteorological instruction, W. M. Wilson; public information, C. F. Talman; membership, C. F. Brooks; physiological meteorology, E. Huntington; agricultural meteorology, J. Warren Smith; hydrological meteorology, R. E. Horton; business meteorology, A. W. Douglas; commercial meteorology (effect of weather and climate on transportation by land and inland waterways), H. J. Cox; marine meteorology, J. H. Scarr; aeronautical meteorology, C. T. Menoher.

Of the 29 papers presented at the meetings referred to, several have special application to agriculture, among these being Weather Conditions in the Orchard Regions of the North Carolina Mountain Slopes, by H. J. Cox; Evaporative Capacity, by R. E. Horton; Cultivation Does Not Increase Rainfall, by J. W. Smith; Predicting Minimum Temperatures, by J. W. Smith; and Seasonal Distribution of Maximum Floods in the United States, by A. J. Henry.

The present membership of the society is about 600, of whom over half are amateur or professional meteorologists.

Association of Southern Agricultural Workers.—At the Atlanta meeting of the association, held February 24 to 26, 1920 (as noted editorially on page 301, this issue) the following officers were elected: President, D. T. Gray, of North Carolina; vice president, T. P. Cooper, of Kentucky; secretary, C. A. Mooers, of Tennessee; and additional member of the executive committee, W. H. Dalrymple, of Louisiana. G. S. Templeton, of Alabama, was elected chairman, and D. G. Sullins, of Georgia, secretary of the animal husbandry section; George Roberts, of Kentucky, chairman, and R. Y. Winters, of North Carolina, secretary of the agronomy section; W. C. Lassetter, of Arkansas, chairman, and E. A. Miller, of Washington, D. C., secretary of the extension section; H. P. Stuckey, of Georgia, chairman, and C. D. Matthews, of North Carolina, secretary of the horticultural section; and S. H. Essary, of Tennessee, chairman, and J. A. McClintock, of Georgia, secretary of the pathological section.

EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Chief, Office of Experiment Stations.*
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EXPERIMENT STATION RECORD.

Vol. 42. April, 1920. No. 5.

The question of the field of the experiment station and the border line between it and the type of personal service now covered in agricultural extension has long been under consideration. It dates back prior to the formal organization of extension work, for in the past the stations not only took their results out to the farmers as far as they were able, but sometimes planned work with them which was designed quite as much for demonstrating things which had been determined as for gathering additional data. This resulted in a class of work which was designated as demonstration experiments or demonstration tests.

The advent of extension work on a more comprehensive scale naturally brought up the consideration of its scope, and raised certain questions regarding the boundary line between it and the experiment station. These questions have increased in complexity as the extension enterprise has developed and as it has expanded its operations to cover a wide variety of activity. They have not arisen from conflict between the two agencies, but rather in the course of administration calling for the observance of distinctions implied in the appropriations, especially those made by the Federal Government. The popularity of the extension movement has often led to demands and to tendencies which it is found necessary to consider quite carefully.

It is evident that concrete rules can not be laid down which will cover all cases likely to arise, and it is difficult at the present stage to formulate definitions which will be neither so general as to be ambiguous nor so qualified as to impose undue limitations. It may be profitable, however, to consider some of the underlying principles related to the respective fields, and general limitations which the theory of the service implies. This is done on the basis of a recent discussion of the matter in the States Relation Service, particularly between the two extension offices and the Office of Experiment Stations, with general agreement on the following points.

The aim and purpose of the experiment station is to acquire and establish information regarding facts and principles and their application. The information supplied is usually of general character dealing with matters of wide application, as distinguished from that relating to narrowly restricted localities or individual conditions. The smallest unit of station work—that to which it adapts its study directly, is usually a group of persons having a common problem or a locality representing a special type of conditions; it can rarely work directly for the individual farmer or for small localities except as specific questions are involved. Its limited force and means would not permit of individual service, even if it were a desirable form for its activities to take; and another agency is now provided to cover that field.

Since the scope of the station work is broad and general rather than detailed and localized, the station results may to some extent require local interpretation. There are so many varying factors of soil, climate, economic and other conditions that it is impracticable for a station to take these all into specific account. It would be unfeasible to test their findings with reference to all these variables and work out possible modifications to suit particular sets of conditions. To a considerable degree the station must deal in generalities, with a knowledge of limitations which affect them. Of course it must try out the results of its investigations under practical conditions, and it must reduce its findings to practice; the aim of its work is distinctly practical and does not stop with theory. But the station must deal with the large things and with facts of general or average range, leaving to the farmers and their advisors the fitting of these things into individual practice or localized conditions.

This does not make the work of the experiment stations any less practical or valuable to the farmer, or less essential to progress in agriculture. It means that they attain their highest and most fundamental usefulness when they deal with broad facts and principles and devote themselves to basic problems which are new to science or to the average conditions of the region, leaving the questions of A, B, and C's farms to the constituted agencies. The latter are in close contact both with the farmers and the stations, and are thus in position to serve as middlemen in science.

The station can supply many matters suitable for teaching or demonstrating which are fundamental and practically universal in application, but in many others a point is soon reached where local and individual conditions modify the result or its adaptability. In this respect their results may be incomplete for some practical purposes. They develop the truth but not always the whole truth in its special applications. They leave something for good judgment and practical considerations. This is inevitable. No amount of experimenting can supply infallible rules to be followed literally without guidance or judgment. It will always be necessary for the farmer in the front line of progress to take some chances and to assume a certain amount of risk in trying new things.

Agricultural extension was conceived as a teaching function. As applied to the introduction of better methods and practices, the use of superior strains or individuals, economy of time and material, and the like, it attempts to instruct largely by examples which the farmers supply under direction. It is a dissemination or demonstration of things which are known in their more essential details.

The extension service aims at the individual farmer and his particular environment. It deals with facts, principles and applications which have already been determined as far as general and average conditions go, but which in their successful introduction may often require more intimate consideration of local aspects. This will sometimes necessitate supplementing the existing information by that which relates more specifically to a given set of conditions.

A considerable source of aid in extension is the experience of successful farmers, in the locality or elsewhere. This, again, may need to be tested under somewhat different sets of conditions, which will introduce an element of doubt as to the outcome.

The need for supplementing or interpreting locally the information at its disposal, and the means of doing it, is the immediate cause of most of the uncertainty which has arisen as the extension work has developed, and particularly as it has become specialized. It has resulted in some cases in a feeling that it may be necessary to go beyond the actual field of teaching and employ the method of experimentation. It is in this zone of doubt that overlapping is most likely to occur.

If it is argued that the information which is to be extended to the farmer must be reliable and complete in all respects, the reply is that the essential facts and principles must be true, and their general practical application beyond reasonable doubt; but it would lead to confusion of function and duplication of effort if the extension workers were to abandon their field temporarily and undertake by formal methods of experimentation to work out or check up new facts. And this does not seem necessary.

The method of extension differs throughout from that of experimentation; it has its own ways of finding out the details it needs to know and helping the farmer to acquire those which are essential to him. The method of the station is the experimental method, while that of extension is the demonstration; one is to determine, the other to show.

The term "demonstration" is used broadly, not only as a means of visual instruction by example, but also of making comparisons to decide details about which there may be some question. The result can not be absolutely prophesied in the case of demonstrations under new conditions any more than it can in some types of experiments, although the range of doubt will usually be narrower. The demonstration seeks a relative rather than an absolute or accurately measured result, and aims to show the farmer or help him decide what is satisfactory and advantageous.

The attempt by this means to introduce the teachings of experiment and experience into more general use often raises the question of comparisons to see what is best or most practical. Such comparisons may involve differences which are not wholly apparent to the eye, and hence require weights and measurements to be made. The latter, however, are of relatively simple character as contrasted to the refinements of experiment, and are taken for the purpose of teaching rather than of gathering new data. Thus both the method and the motive are factors distinguishing the two lines of effort. The distinction is well put by a writer who has said: "When the motive is educational, when the methods employed are applicable to ordinary farm practice, and when the benefits accrue primarily to the individual who conducts the work or to his neighbors, such work constitutes good demonstration. On the other hand, when the motive is the acquisition of knowledge without reference to the conditions of a particular individual, and when the method is concerned with the accuracy of the data rather than means which would be feasible in farm practice, the work must be regarded as experimentation."

A committee on extension organization and policy, reporting to the Association of American Agricultural Colleges and Experiment Stations a few years ago, defined demonstration as "an effort designed to show by example the practical application of established principles and facts." A test it conceived to be "an effort to prove or disprove the practical application of established principles or facts under a given set of conditions." Because of the limitations due to climate, soil, and other conditions, the committee concluded that the making of demonstrations may include the making of tests. The nature of these demonstration tests it did not undertake to define, but it differentiated them from tests forming a part of an experiment, which it defined as "an effort designed to discover principles or facts and methods of their application."

Successful demonstration, therefore, does not imply the possession of full knowledge or absolute certainty as to what the outcome will be. Frequently it may lead to modification or adaptation of what is to be taught; but the new information it develops will be largely circumstantial and comparative rather than fundamental. A variety demonstration does not attempt to determine what is intrinsically the best type of variety and the qualities which make it so, but to show which is the best suited under prevailing practical conditions. It does not require the refinement or exactitude of the experimental method, and a part of its real value is that it is a personal product.

But when an extension force arranges for cooperation with a group of farmers, involving series of measured plats, the supervision by its officers of the details of putting in the crop, applying the fertilizer, the taking of observations through the season, harvesting and weighing the product and drawing the conclusions, it has not only adopted the method of the experiment station, but it has transferred its activities from extension to station work. The process involves systems of checks and records, office clerks and tabulations, the study and interpretation of the data, and possibly also publication. The primary purpose in such a case is to gather data for the extension forces as a basis for their work, rather than to teach the farmer and help him to learn through demonstration. The function has changed from that of teaching to experimenting. As a pupil the farmer has been largely eliminated. Learning by doing has been replaced by performance for him or under close supervision, and the specialist instead of the farmer draws the conclusions and makes the interpretations.

The theory of farm demonstration is that the fact or method to be disseminated is to be taught to the individual by having him perform the operations himself, rather than by imparting it or making the demonstration for him; and from this point of view it is a mistake to work out the entire process in advance in the same sense that it would be for the teacher in school or college to do the work for the pupil. To a large extent farm demonstration is for the farmer a process of finding out and forming judgment, and this is important since in a sense every farm is a problem in itself and the successful farmer must be resourceful in his information and sound of judgment in fitting it to his particular case.

In general, the progress of extension must wait on investigation as far as new fundamental information is concerned. This may sometimes be disappointing and annoying, but instruction can not safely progress beyond the supply of knowledge or sound experience. As a result, teaching may be retarded or the information to be taught may sometimes be incomplete in certain details or not thoroughly understood. While field demonstrations and the experience of practical men will help to clarify these matters, these will have very definite limitations as a means of deriving new facts.

It is a safe assumption, for example, that on a deficient soil the use of fertilizer will bring increased crops and, within limits, an increased net return, and this can be demonstrated; but whether phosphoric acid or nitrogen or potash is the controlling factor on the soil type in question will usually not be determined in the first instance by such a demonstration, and if the deficiencies of that soil type have not been worked out it is not conceived to be the business of the extension service to determine them. This is too basic a matter and that service can not undertake it in any thorough way without changing its field and its methods. It may not be possible to make specific recommendation until this information is at hand, but in most cases the soil survey and the field tests following it, together with other information which the station is in position to furnish, should shed considerable light and furnish a fairly definite background. If the State has not provided a soil survey and studies of the fertilizer needs of soil types, the disclosure by the extension service of the lack of that information and its consequences is a good argument for securing funds for such a purpose. Temporarily it may be necessary to make shift as well as possible, but the lack of data which requires systematic investigation is not a justification for the extension force to go out of its field to supply it. The same is true of attempts to determine the effect of fertilizers on quality of a crop.

Other matters for which there is a good general background but a lack of detailed local information can properly be developed through the method of demonstration. Take the case of varieties, with the attempt to introduce those specially suited to localities; the variety tests of the stations will have supplied much general knowledge regarding the qualities and adaptation of the leading ones, but these tests can not have extended to each locality, and hence some doubt may remain as to which of a number are the best. The advantage of varieties superior to those used locally can be demonstrated, and at the same time the respective merits of a number of the more promising ones can be shown. It is not necessary for the extension experts to determine this for the farmers, but they can render the best service by interesting the farmers and organizing the demonstrations, showing those who take part how to ascertain for themselves which ones are the best suited to their purpose.

Again, to go a step further, such a practical question as the growing of soy beans with corn for mixed silage may involve some important practical facts which are not wholly at hand. While the principal varieties employed for the purpose have perhaps been studied separately, the growth of the crops together, with the influence they exert on one another, involves questions which it may be essential to ascertain in order that the beans may be planted at the right time to furnish the largest and richest amount of feed it is practicable to secure in such a combination. Lack of such information might serve to retard the introduction of the practice, or it might in considerable measure be overcome by demonstrations among a selected list of farmers. It would not, however, warrant the extension specialists in laying out elaborate experiments to be tended by their representatives and conducted after the manner of station experiments. A demonstration made by the farmers under general direction could include planting at different stages, and would show in general the advantage of time of planting as illustrated by the influence of the two crops on one another, at the same time that it demonstrated the value of the mixed silage.

Many things of this sort must inevitably be worked out by the farmers themselves, under suitable general direction, for it would be quite as impossible for the extension specialists as for the station people to determine for each locality dates and rates of seeding, the best varieties of crops, the exact combinations and amounts of fertilizers most advantageous or profitable, or a long list of other points in practical management. The station forces have not found this practicable in any large way and it is not more practicable for the extension forces, except as they use the farmers themselves and employ the method of demonstration.

There is a close analogy between this and other forms of teaching. Except in the more advanced grades of instruction where the pupil is being taught how to acquire original information, the teacher employs such material as has been provided and put into teaching form. The process is one of giving out rather than acquiring by the teacher's own efforts, and advance waits on new stores being supplied by other agencies.

In many respects the extension forces and the station forces will supplement one another's efforts; in not a few will they work hand in hand. If such cooperation is relied on, there will be less occasion for entering one another's field.

The experiment station ought to carry its work up to the time when it can be safely relinquished to the teaching forces. It must test its results to a sufficiently broad extent under a variety of field conditions to establish their truth and enable safe generalization. This may be furthered by mass trials. When the station experts establish series of local tests to try out the application of some of their results in ordinary practice, they are within their field. The attempt is to reduce to practice the results of experiments or the theoretical conclusions of investigation. This is wholly legitimate, as long as the matter is still in the controversial or doubtful stage with respect to its practical application and its limitations. Until these have been cleared up and possible adaptations made, the matter can not properly be turned over to the extension service for introduction and demonstration.

In this mass trial, at least at a certain stage, the extension force can often be of much assistance and save considerable expense. For example, in the matter of improved strains of crops which a station has developed or brought in, quite wide and severe tests will be essential before recommending them broadly. The extension forces may at some stage be asked to assist in this by suggesting good farmers to make the trials, and possibly arrange with them for carrying them on and exercise something of an oversight of them. But the enterprise will remain a station enterprise and the extension department will not be responsible for it.

In other cases the station men will be ready to recommend these strains or varieties to the extension people for introduction in a limited way, or to increase the seed supply. Then the extension force can arrange for demonstrations, getting farmers to plant them alongside their common varieties and report on them. The demonstrations will be supervised in a general way, and they will be checked by comparison with other demonstrations on farms in the neighborhood. Although the individual trials will probably lack the accuracy of such a test as the station would itself make, they will supplement the general knowledge regarding the variety and its practical adaptation. For the station itself to undertake extensive trials with farmers for the primary purpose of demonstrating to them the value of an improved selection or of a new method or result, would be to go outside its own field into that of the extension service where the organization, methods and funds for supplying this service already exist.

The extension service will point the need of investigation in many lines. Its local work and close contact will frequently discover instances where further information is required of the type which the station is designed to supply. It will thus stimulate the work of the station and help to bring support for it. To undertake to supply the deficiencies through its own organization would be to weaken the support for the agency on which it must rely very heavily.

Extension work is beginning to overtake investigation in some cases, and in others is embarking on fields which have been only sparingly occupied by the stations. This may result in temporarily limiting or handicapping its efforts, but in the long run extension can not advance along new lines more rapidly than investigation prepares the way, and to secure the highest results the two will need to go hand in hand. With so much to be done, with so broad a field to be covered, and so much that it is feasible to do at the present time, there is little occasion for confusion of the field if the underlying theory of the service is observed, and little profit from overstepping the boundaries of either agency.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Modern chemistry and chemical industry of starch and cellulose, T. C. Chaudhuri (*London: Butterworth & Co., 1918, pp. X+156, pl. 1, fig. 1*).—This volume attempts to give a brief survey of the chemistry of cellulose and starch and of various chemical industries that have direct or indirect bearing upon these substances, with particular reference to industrial possibilities in India.

The synthesis of fats, W. Fahrion (*Chem. Umschau Geb. Fette, Oele, Wachse, u. Harze, 26 (1919), Nos. 10, pp. 125–127; 12, pp. 149–151; 13, pp. 161–163*).—Various methods that have been attempted for the synthesis of fats are outlined and discussed, with references to the literature.

The catalytic reduction of fats with palladium, F. F. Nord (*Ztschr. Angew. Chem., 32 (1919), No. 78, Aufsatz., pp. 305–309; abs. in Jour. Soc. Chem. Indus., 38 (1919), No. 23, p. 913A*).—A 1 per cent solution of palladium chlorid, in the presence of hydrochloric acid and a small amount of a colloidal substance such as gum arabic, has proved to be a suitable catalyzer for the hydrogenation of vegetable oils such as rapeseed, cottonseed, soy bean, and castor oils.

In the method described a mixture of 50 gm. of the oil and 10 cc. each of a 1 per cent solution of palladium chlorid, a 1 per cent solution of gum arabic, and concentrated hydrochloric acid, is warmed to from 55 to 63° C. in an autoclave provided with a stirring device. Hydrogen is then admitted to a pressure of 8 atmospheres, and the reaction allowed to progress to completion, with constant stirring. Under these conditions the time required for the reaction is generally from seven to ten hours, after which the hardened oil can be melted and completely separated from the precipitated palladium.

The hydrogenation of oils, C. Ellis (*New York: D. Van Nostrand Co., 1919, 2. ed., rev. and enl., pp. XVII+767, figs. 249*).—In the second edition of this book, the first of which has been previously noted (E. S. R., 32, p. 416), the developments in the oil-hardening industry are brought up to date and suggestions are made regarding future possibilities. The volume includes appendixes on hydrogenated oil, patent litigation in England, and patent litigation regarding edible hydrogenated oils in this country. This last item is of historical and general interest in presenting details of the beginning of oil hardening in the United States.

The change of refractive indices of fixed oils with temperature, C. H. Wright (*Jour. Soc. Chem. Indus., 38 (1919), No. 22, pp. 392T–394T*).—The author explains the derivation of a formula which may be used to calculate the refractive index of any fixed oil at a certain temperature from the value determined at another temperature. A temperature of 40° C. is recommended as a standard to which all determinations of refractive index at other temperatures should be reduced. The formula for determining the refractive index at this temperature is as follows:

$$n' = (n-1) \times \frac{0.9696}{1-0.00076t} + 1$$

where n' and n=refractive indexes at 40° C. and at the given temperature t, respectively. To simplify the calculation, the numerical values of the fraction have been worked out for various temperatures, and are presented as a table of factors.

Oil of juniper berries, H. Matthes and W. Rossié (*Arch. Pharm.*, *256* (*1918*), *No. 4*, *pp. 284–288; abs. in Chem. Abs.*, *13* (*1919*), *No. 12*, *p. 1401*).—The oil expressed from the berries of the red juniper (*Sambucus racemosa*) formed a golden yellow, odorless, and mild tasting product, which darkened on exposure and deposited small crystals of tripalmitin but did not harden completely on long exposure in a thin film. The constants of the oil were found to be as follows: Specific gravity at 15° C. 0.9215, temperature of solidification, —13°, refractive index at 25° 1.471, acid number 3.11, saponification number 192.56, iodin number 116.95, Hehner number 94.95, Reichert-Meissl number 0.77, and Polenske number 0.75. The oil contained the esters of about 20 per cent of solid and 74 per cent of liquid fatty acids, the latter being made up of approximately 10 per cent of linolenic, 32 per cent of linoleic, and from 55 to 58 per cent of oleic acid. The oil gave a positive elaidin reaction.

Pine seeds and pine seed oil, H. Matthes and W. Rossié (*Arch. Pharm.*, *256* (*1918*), *No. 4*, *pp. 289–302; abs. in Chem. Abs.*, *13* (*1919*), *No. 12*, *p. 1401*).—An examination of the seeds of *Pinus pinea* and the oil obtained from them by expression gave the following results. The air-dried seeds contained from 5.94 to 6.28 per cent water, 5.09 per cent nitrogen, 5.98 per cent sugar calculated as sucrose, 0.048 per cent lecithin phosphoric acid calculated as P_2O_5, mineral substances, and 45.03 per cent oil. The expressed oil was bright yellow, mobile, odorless, and of a mild and pleasant flavor.

The principal constants of the oil were as follows: Specific gravity at 15° C. 0.9198, temperature of solidification —21°, refractive index at 40° 1.4678, acid number 3.3, saponification number 192.76, iodin number (Hübl) 124.97, Hehner number 94.81, Reichert-Meissl number 0.8, Polenske number 0.6, and acetyl number 10.9. The oil consisted essentially of the triglycerids of palmitic, stearic, oleic, and linoleic acids in the proportion of about 5.5 per cent solid and 94.5 per cent liquid acids, the former consisting of 8 per cent stearic and 92 per cent palmitic acids, and the latter of from 51 to 57 per cent oleic, and about 43 per cent linoleic acids.

The oil is recommended for edible purposes.

Walnut oil, H. Matthes and W. Rossié (*Arch. Pharm.*, *256* (*1918*), *No. 4*, *pp. 302–308; abs. in Chem. Abs.*, *13* (*1919*), *No. 12*, *p. 1400*).—Fully ripe walnuts (*Juglans regia*) which had dried from three to four months yielded on cold expression about 44 per cent of a greenish-yellow, mobile oil of a pleasant odor and nutty taste, and on extraction at higher temperature a green oil with a sharp taste and odor. When exposed in a thin layer to air the oil dried completely in four or five days. The principal constants of the cold-pressed oil were as follows: Specific gravity at 15° C. 0.9238, temperature of solidification —28 to —29°, refractive index at 25° 1.474, acid number 9.87, saponification number 192.6, iodin number 148.3, Hehner number 96.02, Reichert-Meissl number 3.19, and Polenske number 1.6.

The oil contained about 7 per cent of solid and 73 per cent of liquid fatty acids, the latter consisting of 4 per cent linolenic, from 78 to 83 per cent linoleic, and from 14 to 15 per cent oleic acids.

The cold pressed oil is considered suitable for edible purposes as well as for a drying oil.

The effect of mold upon the oil in corn, F. Rabak (*Jour. Indus. and Engin. Chem., 12 (1920), No. 1, pp. 46–48*).—This paper reports a study at the Bureau of Plant Industry, U. S. Department of Agriculture, of the changes taking place in corn oil due to the growth of Penicillium on the corn. Five samples of corn were examined, including an ordinary market sample and the same after being innoculated with Penicillium and allowed to stand for varying intervals up to 90 days. The appearance and the moisture and oil content of the samples, and the physical and chemical properties of the oils obtained from each, are presented in tabular form.

The data obtained indicate that the spoilage of corn from the growth of mold is accompanied by a consumption of oil by the mold, the amount decreasing from 5.58 per cent (calculated on dry weight) in the fresh sample to 2.02 per cent in the 90-day sample. As spoiling developed, the oil became strong and bitter and the specific gravity and index of refraction increased. The changes in chemical composition consisted of a decided increase in free acids, soluble acids, hydroxylated acids, and unsaponifiable constituents, and a decrease in volatile acids, insoluble acids, and unsaturated acids.

A chemical study of the ether extracts of soy bean leaves, E. M. Nelson (*Jour. Indus. and Engin. Chem., 12 (1920), No. 1, pp. 49, 50*).—This paper reports an investigation of the ether extract of soy bean leaves, which had been found to have a high iodin number. The results reported indicate that the most highly unsaturated compounds in the leaves are not oils, but probably belong to the alcohol group of the waxes. These do not form a hard film on drying, and consequently soy bean leaves do not form an available source of oil for paint manufacture.

The identity of hordein and bynin, H. Lüers (*Biochem. Ztschr., 96 (1919), No. 1–3, pp. 117–132, fig. 1*).—Analyses by the Van Slyke method of the hordein of barley and the bynin of malt are reported. These indicate that the two proteins are identical, and that bynin probably represents a portion of the hordein which has remained unchanged during the germination of the grain.

Chemical analyses with membrane filters, R. Zsigmondy and G. Jander (*Ztschr. Analyt. Chem., 58 (1919), No. 6–7, pp. 241–280, figs. 2*).—A filtering apparatus in which a thin parchment membrane is used in place of filter paper is described. The comparative results of various analytical determinations with the use of this membrane filter and of ordinary filter paper are reported, which indicate that more accurate results are obtained with the membrane filter.

A thermoregulator with the characteristics of the Beckmann thermometer, R. B. Harvey (*Jour. Biol. Chem., 41 (1920), No. 1, pp. 9, 10, pl. 1*).—A thermoregulator devised at the Bureau of Plant Industry, U. S. Department of Agriculture, is described and illustrated.

The instrument, which can be set easily at any temperature between −20 and +250° C., has a very low heat capacity and shows the same lag effects as the Beckmann thermometer. The mercury column is of sufficient diameter to carry the current required to operate a 150-ohm relay using 2 or 4 volts. The lower platinum contact is made in an enlargement of the capillary to prevent sticking of the mercury at that point, and the upper contact is placed at the end of the capillary so that small temperature changes will make or break the current.

The determination of hydrogen-ion concentration, J. W. M. Bunker (*Jour. Biol. Chem., 41 (1920), No. 1, pp. 11–14, fig. 1*).—An apparatus for determining H-ion concentration is described which is essentially a modification of the bubbling electrode used in a closed vessel.

The hydrogen electrode is made from a piece of one-eighth inch tubing with a short piece of platinum wire sealed in at the bottom, projecting outside about one-eighth inch and inside far enough to make contact with the mercury which fills the lower part of the tube. The tube is fitted tightly by means of a rubber stopper into an outer side-arm tube, at the lower end of which is an oval opening. When the assembled electrode is dipped into a liquid and hydrogen gas allowed to enter through the side arm, a large bubble forms temporarily at the base of the tube covering the wire. When the bubble breaks, the liquid rushes in, thus giving the effect of the rocking electrode of Clark (E. S. R., 34, p. 804). Details of the apparatus are given and illustrated by a diagram.

A simple hydrogen electrode, C. H. Bailey (*Jour. Amer. Chem. Soc., 42 (1920), No. 1, pp. 45–48, figs. 2*).—This paper describes a hydrogen electrode devised by the author at the Minnesota Experiment Station for use particularly in determining the H-ion concentration of water extracts of foods.

The apparatus is made by blowing a small bulb in the closed end of a 7 mm. tube, which is then bent at an angle of 45° about 50 mm. below the top of the bulb and fitted at the open end with a solid glass stopper. The metal electrode, consisting of a round piece of platinized thin gold plate 5 mm. in diameter, is fused into the bulb arm of the tube just above the bend. In using the electrode, the open arm is completely filled with the liquid and the tube so tilted that the liquid flows into the bulb arm, displacing the air. This is repeated until the bulb arm is completely filled and the open arm to a depth of about 10 mm. above the top of the bend. The hydrogen is led into the apparatus by means of a small glass tube reaching to the lower part of the bend, enough being admitted to fill the closed arm. The open arm is then completely filled with the liquid, stoppered, and shaken thoroughly, after which the stopper is removed, a little of the liquid shaken out, and the outer surfaces of the tube rinsed with distilled water and dried. To complete the circuit the metal electrode is connected with the potentiometer, while a slender V-shaped siphon tube filled with saturated potassium chlorid solution connects the open tube with a vessel filled with the same solution, and this is in turn connected to the calomel electrode.

The apparatus is said to be easy to fill and clean, and to come to equilibrium promptly. Only about 10 cc. of the extract is required to rinse and fill the cell.

Apparatus for the volumetric determination of small amounts of carbon dioxid in a liquid by means of a strong current of air at ordinary temperature and pressure, A. Constantino (*Atti R. Accad. Lincei, 5. ser., Rend. Cl. Sci. Fis., Mat. e Nat., 28 (1919), II, No. 3–4, pp. 118–121, fig. 1*).—In the apparatus described and illustrated, a strong current of air from which the carbon dioxid has been removed by passing over soda lime is drawn through a flask containing dilute sulphuric acid and then through a Woulfe bottle containing barium chlorid solution. When the apparatus has been entirely freed from carbon dioxid, the solution to be examined is admitted through a funnel tube into the sulphuric acid flask. The carbon dioxid set free passes over into the barium chlorid solution, and is subsequently determined by titration with a standard solution of hydrochloric acid.

Apparatus for measurement of oxidase and catalase activity, R. B. Harvey (*Jour. Gen. Physiol., 2 (1920), No. 3, pp. 253, 254, fig. 1*).—A description is given of an oxidase apparatus designed at the Bureau of Animal Industry, U. S. Department of Agriculture, which is said to incorporate the advantages of both the simplified Bunzel apparatus (E. S. R., 32, p. 508) and the original design (E. S. R., 27, p. 9). The chief source of error in the former apparatus, that of making no provision for the absorption of CO_2, is removed by the use of a caustic tube in which 1 cc. of N/10 alkali is placed to absorb the CO_2 produced during the reaction. On shaking the apparatus the liquid surges back and forth beneath this tube forcing the air over the alkali.

[Moisture determination], G. F. LIPSCOMB (*South Carolina Sta. Rpt. 1919, p. 35*).—A preliminary report is given of a method of determining moisture in soils and agricultural products by heating the material in a vacuum containing tubes of calcium chlorid. In determining the moisture content of cottonseed meal by this method it was found possible to remove from 1 to 2 per cent more moisture from the material than by the usual method.

The McCrudden gravimetric calcium method modified, J. O. HALVERSON and J. A. SCHULZ (*Jour. Indus. and Engin. Chem., 12 (1920), No. 1, pp. 77, 78*).—The authors at the Ohio Experiment Station have found that the substitution of the volumetric asbestos Gooch method for the gravimetric procedure in the McCrudden calcium method (E. S. R., 23, p. 9) has greatly facilitated the determination of the small amounts of calcium present in biological and agricultural products.

High grade ignited long-fibered asbestos is placed in hot sulphuric acid (1:5) and digested for one hour at from 60 to 70° C., with occasional shaking while adding a few drops of potassium permanganate. The material is then placed on a Büchner funnel and washed with distilled water faintly colored with potassium permanganate until free of acid.

In preparing the Gooch crucibles the treated asbestos is separated into three grades of fineness, the long coarse fibers being used first as a foundation, next the medium fibers, and finally the fine sediment. After the calcium oxalate precipitate is washed free from oxalate and oxalic acid, the precipitate and pad are transferred with a small quantity of hot water to an Erlenmeyer flask and titrated immediately at 65° C., using sulphuric acid (1:5).

Data are presented showing that this method gives results almost identical with the gravimetric procedure.

A method of estimating small amounts of calcium, S. PERN (*Proc. Roy. Soc. Victoria, n. ser., 30 (1918), No. 2, pp. 137, 138*).—A method of estimating small amounts of calcium, particularly applicable to the determination of calcium in blood, is described. This method consists essentially in ashing a 1 cc. portion of the blood, dissolving the ash in a 2 per cent acetic acid solution to a volume of 2.5 cc., adding 1.5 cc. of methyl alcohol and 3 drops of oxalic acid, and comparing the turbidity of the solution with that of standards containing varying known amounts of a calcium salt dissolved in acetic acid and treated in a like manner with methyl alcohol and oxalic acid.

In place of ashing the blood sample, the calcium may be dissolved by mixing a given quantity of the blood with two or three times its volume of a 6.5 per cent solution of trichloracetic acid and allowing it to stand for 24 hours. Two cc. of the clear supernatant liquid is then pipetted off, neutralized until only faintly acid, and treated with methyl alcohol and oxalic acid as in the first method.

The author claims that the method, while somewhat crude, is of sufficient accuracy for clinical purposes.

The volumetric determination of sulphates by oxidation of benzidin sulphate with $KMnO_4$, P. L. HIBBARD (*Soil Sci., 8 (1919), No. 1, pp. 61–65*).—The author has modified the details of the method of Raiziss and Dubin (E. S. R., 33, p. 415) in order to eliminate inaccuracies due to variations in temperature, time, concentration, and incompleteness of oxidation.

The essentials of the modified method, which is described in detail, consist in freeing the solution from organic matter, iron, nitrates, phosphates, and heavy metals; precipitating the SO_4 completely as the insoluble benzidin salt; and measuring the amount of combined benzidin by titration with an excess of standard potassium permanganate at boiling temperature, removing the excess by standard oxalic acid, and completing the titration with permanganate.

The method is said to be rapid, and sufficiently accurate for most work on soil extracts, biological fluids, or other similar solutions containing small amounts of sulphates.

An improved method for the estimation of nitrates in water by means of the phenolsulphonic acid reaction, R. C. FREDERICK (*Analyst, 44* (*1919*), *No. 521, pp. 281–284; abs. in Chem. Abs., 13* (*1919*), *No. 23, p. 3259*).—The method described is a modification of Sprengel's method in which the sample is evaporated to dryness on a steam bath, the residue treated with phenolsulphonic acid dissolved in water, rendered alkaline with sodium or potassium hydroxid, made up to a definite volume, and matched as to color against standards prepared from potassium nitrate. In the modification described the error caused by the presence of chlorids is largely eliminated by adding the phenolsulphonic acid before evaporation, and evaporating until all the water is removed. A more dilute solution of phenolsulphonic acid is used than in the original method, resulting in a much more pure and brilliant color, as well as effecting a large saving of reagents.

Determination of traces of hydrocyanic acid and thiocyanates in a complex medium, L. CHELLE (*Compt. Rend. Acad. Sci.* [*Paris*], *169* (*1919*), *No. 21, pp. 973–975*).—The author states that small amounts of hydrocyanic acid may be detected and determined by passing a rapid current of air through the solution for three hours and collecting the liberated HCN in N/10 KOH. In the determination of thiocyanates the same method is used, after first treating the solution with sulphuric acid and potassium chromate to convert the KSCN into HCN.

Formation of cyanic acid by the oxidation of organic substances and its quantitative identification, R. FOSSE (*Compt. Rend. Soc. Biol.* [*Paris*], *82* (*1919*), *No. 25, pp. 1062–1064*).—The author states that the existence of cyanic acid as a product of the oxidation of organic substances such as glucose, glycerin, amino acids, etc., has been proved by its isolation and identification as silver cyanate. If the liquid resulting from the oxidation of one of these substances is neutralized almost completely with dilute nitric acid and treated with silver nitrate, a flocculent precipitate is formed, which on treatment with boiling water partially dissolves. The filtrate on cooling deposits small crystals of silver cyanate, which can be identified by the formation of urea and silver chlorid when heated on a water bath with ammonium chlorid.

Quantitative estimation of indol in biological media, H. F. ZOLLER (*Jour. Biol. Chem., 41* (*1920*), *No. 1, pp. 25–36*).—An examination at the Bureau of Animal Industry, U. S. Department of Agriculture, of various methods of determining indol in bacterial cultures is reported, as the result of which a method was evolved which is said to be simple, reliable, and rapid, and to require only the reagents and apparatus common to most laboratories.

The essential features of the modified method consist of adjusting the medium to pH 9.2, at which concentration the indol may be distilled directly instead of with steam, and of determining the indol in an aliquot of the distillate by the use of the nitroso-indol reaction, advantage being taken of the discovery that the sensitivity of the nitroso reaction with indol can be increased more than three-fold by extraction with a few cubic centimeters of either primary isoamyl alcohol or primary isobutyl alcohol. The technique of the method is described in detail.

Influence of hydrogen-ion concentration upon the volatility of indol from aqueous solution, H. F. Zoller (*Jour. Biol. Chem., 41 (1920), No. 1, pp. 37–44, figs. 3*).—This paper reports the results of the study of standard conditions for the separation of indol from various media which led to the adoption of the method noted above.

It was found that the range of most rapid volatilization of indol from the aqueous solutions studied was from pH 8 to 10.5, such concentrations having no appreciable destructive action on the indol molecule.

"The results from the experiments performed suggest that the practice of steam distillation can be supplanted by direct distillation with equal accuracy when the reaction of the solution is taken into account. This direct method of distillation has been practiced in a routine investigation in this laboratory and found reliable and commendable."

The moisture content of cereals, O. A. Nelson and G. A. Hulett (*Jour. Indus. and Engin. Chem., 12 (1920), No. 1, pp. 40–45, figs. 5*).—A method of determining the moisture content of cereals and of other colloidal substances is described. This consists essentially in heating the material in a very high vacuum for definite periods of time and condensing the liberated moisture in a small tube surrounded by solid carbon dioxid.

It is pointed out that, since the smallest amount of decomposition can be accurately determined, it is possible to determine to what temperature and for how long a substance may be heated without obtaining an appreciable amount of water from decomposition.

Insoluble solids in jams, preserves, and marmalades, C. A. Clemens (*Jour. Indus. and Engin. Chem., 12 (1920), No. 1, pp. 48, 49*).—A method for the determination of insoluble solids in fruit products is described which is said to be rapid and easy of manipulation and to be more accurate than the Official Method. The technique is as follows:

From 20 to 25 gm. of the thoroughly macerated sample is weighed out into a 250 cc. beaker, mixed thoroughly with 100 cc. of distilled water, and the beaker covered with a watch glass. The solution is boiled for five minutes and then filtered through an alundum crucible with suction. The residue is washed with boiling water followed by 10 cc. of alcohol and ether respectively, dried in a water oven, cooled, and weighed.

Contribution to the microscopic detection of plant adulterants and substitutes in the investigation of foods and condiments, C. Griebel (*Ztschr. Untersuch. Nahr. u. Genussmtl., 38 (1919), No. 5–6, pp. 129–141, figs. 15*).—The microscopic characteristics of various adulterants of flour, marmalades, and spices are described and illustrated. These include for flour, chaff, straw, and grain embryos; for marmalades and similar products, the fleshy seed cup of the yew berry (*Taxus baccata*), crowberry (*Empetrum nigrum*), and Irish moss; and for spices the seed of the long pepper (*Piper officinarum*) as a substitute for black pepper, and powdered mushrooms (*Boletus edulis*) as a general spice adulterant. Two coffee substitutes are added to those previously noted (E. S. R., 40, p. 508), grape marc and holly berries (*Ilex aquifolium*).

Wild thyme as an adulterant of powdered marjoram, C. Griebel and A. Schäfer (*Ztschr. Untersuch Nahr. u. Genussmtl., 38 (1919), No. 5–6, pp. 141–145, figs. 3*).—The powdered leaves of the wild thyme (*Thymus serpyllum*) have been found in commercial samples of marjoram. The microscopical differences between wild thyme, garden thyme, and marjoram are described and illustrated.

Contribution to the examination of milk, particularly the determination of milk sugar, H. SALOMON and R. DIEHL (*Ber. Deut. Pharm. Gesell., 28 (1918), No. 9, pp. 493–498*).—Three methods of precipitating the proteins from formaldehyde-containing milk in which lactose determinations are to be made are described. The first involves the use of a solution of zinc sulphate, the second of copper sulphate, and the third of asaprol dissolved in citric acid.

Remarks on the analyses of hardened oils, A. GRÜN (*Chem. Umschau Geb. Fette, Oele, Wachse, u. Harze, 26 (1919), No. 8, pp. 101–103*).—It is stated that hardened fish oils and rape seed oil may be distinguished from other hardened oils by their content of behenic acid and other acids of higher molecular weight than stearic acid. Fish oil can be distinguished from rape seed oil from the fact that the former alone contains fatty acids of lower molecular weight than palmitic acid. Methods are outlined for the identification of acids of high and of low molecular weight.

The Ost copper carbonate solution and its suitability for the determination of invert sugar in the products of the sugar industry, P. BEYERSDORFER (*Ztschr. Ver. Deut. Zuckerindus., 1919, No. 765, II, pp. 403–443, figs. 6*).—A detailed study is reported of the value of the Ost alkaline copper carbonate solution for determining invert sugar. The author concludes that the solution is superior in every way to Fehling's solution for the examination of sucrose, refined sugar, and "sweet water." An extensive bibliography on the detection and determination of invert sugar is appended.

Some notes on our knowledge of ultramarine, and a proposal to simplify its analysis, H. KALSHOVEN (*Meded. Proefsta. Java-Suikerindus., Chem. Ser., No. 3 (1919), pp. 11; also in Arch. Suikerindus. Nederland-Indië, 27 (1919), No. 20, pp. 1041–1051; abs. in Chem. Abs., 13 (1919), No. 21, p. 2767*).—This article includes a brief historical survey of the literature on ultramarine and a simple scheme of analysis.

Assuming ultramarines to be solid solutions of colloidal sulphur in various solvents such as oxids of aluminum, boron, silicon, etc., or in combinations of them such as the solvent of ordinary ultramarine, a sodium aluminum silicate, the author considers it unimportant to determine the exact composition of the solvents. Among the qualitative tests recommended are the determination of the fineness of the sample by stirring 1 gm. into 200 cc. of water and noting the time required for it to settle, and the estimation of the coloring effect by mixing one part of the sample with 10 parts of some fine white powder like kaolin or chalk and comparing the color with standard samples. Sulphur is determined by distilling a mixture of 50 gm. of the sample and 100 cc. of acid-free water into 25 cc. of N/10 iodin solution and titrating with N/10 sodium thiosulphate. Not less than 20.5 cc. of the latter should be required. In a true ultramarine boiling alcohol must not take up any color, boiling alkali must not change the color, and boiling acid must destroy the color.

Laboratory experiments on the manufacture of Chinese ang-khak in the United States, M. B. CHURCH (*Jour. Indus. and Engin. Chem., 12 (1920), No. 1, pp. 45, 46*).—The author, at the Bureau of Chemistry, U. S. Department of Agriculture, has succeeded in preparing Chinese red rice or ang-khak, a Chinese vegetable color used in food products, by inoculating unpolished uncooked rice to which 25 per cent of water had been added, with a strain of *Monascus purpureus* isolated from Chinese cheese, and incubating at a temperature of from 22 to 24° C. Other strains of the mold isolated from silage and from red rice gave less satisfactory results as regards growth of the organism and color and friability of the product.

Determination of the water resistance of fabrics, F. P. VEITCH and T. D. JARRELL (*Jour. Indus. and Engin. Chem., 12 (1920), No. 1, pp. 26–30, figs. 2*).—A study at the Bureau of Chemistry, U. S. Department of Agriculture, of the literature on testing the water resistance of fabrics has led to the development of a modified funnel test and a modified spray test, which "when conducted under the standardized conditions described are simple of execution, give results within a reasonable time, and yield more information on the water resistance of cotton duck than other tests which have been tried in the Bureau of Chemistry."

The chemical composition of flax and hemp chaff, C. G. SCHWALBE and E. BECKER (*Ztschr. Angew. Chem., 32 (1919), No. 34, Aufsatzt., pp. 126–129*).—Analyses of flax and hemp chaff for the purpose of determining their suitability for paper manufacture are reported and compared with corresponding figures for spruce wood.

The content of water and ash of both the flax and hemp chaff was similar to that of other woody plants. The ash, unlike that of spruce wood, contained no manganese. The total amount of fat and wax was higher than that of spruce wood but lower than pine. Flax chaff was richer and hemp chaff poorer in pectins than spruce wood. Both flax and hemp chaff were higher in pentosans and lower in cellulose than spruce wood, and contained about four times as much nitrogen as the latter. In practically all constituents the chaff resembled more closely the wood of deciduous than of evergreen trees.

The drying of potatoes and other materials suitable for foods and feeding stuffs, MENDLER (*Landw. Jahrb. Bayern, 6 (1916), No. 8, pp. 327–400, figs. 3*).—This is a survey of the status of the drying industry in Germany at the time of writing (1916). An extensive bibliography is appended.

The manufacture and composition of grape juice preserves in Asia Minor, G. BREDEMANN and C. SCHÄTZLEIN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 38 (1919), No. 1–2, pp. 16–24*).—The manufacture of various Turkish preserves from grape juice and other ingredients is described, and tables are given of the composition of the different products.

METEOROLOGY.

Climatic cycles and tree-growth: A study of the annual rings of trees in relation to climate and solar activity, A. E. DOUGLASS (*Carnegie Inst. Wash. Pub. 289 (1919), pp. 127, pls. 12, figs. 40*).—This is a complete account of a study partly reported in articles previously noted (E. S. R., 31, p. 509, 716; 38, p. 415).

The original plan of the study was based on three fundamental propositions: "(1) The rings of trees measure the growth; (2) growth depends largely upon the amount of moisture, especially in a climate where the quantity of moisture is limited; (3) in such countries, therefore, the rings are likely to form a measure of precipitation. Relationship to temperature and other weather elements may be very important, but precipitation was thought to be the controlling factor" in the region of limited rainfall in which the study was begun. Conifers were selected for the study because of the great areas they cover, the great variety of climates they endure, and especially because of the prominence of their rings. "The chief trees used, with approximate number of rings measured in each, are the yellow pine (*Pinus ponderosa*) about 14,000; Scotch pine (*P. silvestris*) about 9,000; hemlock (*Tsuga canadensis*) 2,500; Douglas fir (*Pseudotsuga mucronata*) 2,500; sequoia (*Sequoia gigantea*) 47,000." The annual growth of trees in the region of Flagstaff, Ariz., was compared with rainfall at that place during 8 to 10 years. Sections of trees from various parts of the United States and other countries were studied and the results correlated with rainfall and sunspots by special methods developed by the author. The conclusions reached are summarized as follows:

"The variations in the annual rings of individual trees over considerable areas exhibit such uniformity that the same rings can be identified in nearly every tree and the dates of their formation established with practical certainty. In dry climates the ring thicknesses are proportional to the rainfall with an accuracy of 70 per cent in recent years, and this accuracy presumably extends over centuries; an empirical formula can be made to express still more closely this relationship between tree-growth and rainfall; the tree records, therefore, give use reliable indications of climatic cycles and of past climatic conditions.

"The tree's year for such records begins in the autumn. Double rings are caused by spring drought and are indicative of the distribution of rainfall throughout the year.

"Tree records may be used in the intensive study of the location of homogeneous meteorological conditions and in outlining meteorological districts. Certain areas of wet-climate trees in northern Europe give an admirable record of the sunspot numbers and some American wet-climate trees give a similar record, but with their maxima one to three years in advance of the solar maxima. It is possible to identify living trees giving this remarkable record and to ascertain the exact conditions under which they grow. Practically all the groups of trees investigated show the sunspot cycle or its multiples; the solar cycle becomes more certain and accurate as the area of homogeneous region increases or the time of a tree record extends farther back; this suggests the possibility of determining the climatic and vegetational reaction to the solar cycle in different parts of the world. A most suggestive correlation exists in the dates of maxima and minima found in tree-growth, rainfall, temperature, and solar phenomena. The prevalence of the solar cycle or its multiples, the greater accuracy as area or time are extended, and this correlation in dates point toward a physical connection between solar activity and terrestrial weather. The tree curves indicate a complex combination of short periods including a prominent cycle of about two years. An instrument has been constructed which promises special facility in the analysis of such periods."

It was incidentally observed in this study that the response in tree growth to rainfall was more prompt on well-drained limestone soil than on more compact, less well drained soils of volcanic origin.

A very complete bibliography of literature bearing on the subject is given.

The effect of weather upon the yield of potatoes, J. W. SMITH (*Potato Mag., 1 (1919), Nos. 10, pp. 11–14, 32; 11, pp. 15–17; 12, pp. 7, 16, 17, 27; 2 (1919), No. 1, pp. 16, 17, 33, 34, figs. 23*).—This article discusses the climatic conditions of the natural habitat of the potato and of the regions in which potato growing has been most successful, dates of planting and harvesting, water and temperature requirements, correlation of weather factors and yield, relation of region of growth to quality of seed potatoes, and relation of weather conditions to potato diseases. A short bibligraphy of the subject is also given.

As in previous articles on the subject (E. S. R., 38, p. 716), emphasis is placed upon the importance of cool, wet weather during the first ten days of July. Further investigation of this and similar subjects in agricultural meteorology is urged. The article suggests a number of important lines for such investigation.

On the effect of topography on the precipitation in Japan, T. TERADA ET AL. (*Jour. Col. Sci. Imp. Univ. Tokyo, 41 (1919), Art. 5, pp. 24, figs. 5*).—An analysis of data obtained at selected stations during the 18 years, 1900–1917, shows "the remarkable influence of topography on the distribution of precipitation . . . with respect to the yearly as well as the monthly amounts. . . . It is shown that the effect is largely determined by the component of the barometric gradient taken in a direction a little inclined to the axial line of the land. . . . A peculiar relation between the earthquake frequency and the barometric gradient is pointed out. A vector diagram method of investigating the different relations of the precipitation with the barometric gradient is illustrated. The necessity of taking the percentage values of the precipitation is emphasized."

Precipitation, run-off, evaporation, and drainage in continental middle Europe, W. Halbfass (*Naturw. Wchnschr., 34 (1919), No. 36, pp. 513, 514*).—This is a brief discussion of an article on this subject by Fisher, previously noted (E. S. R., 40, p. 810).

Annual report of the Iowa Weather and Crop Service Bureau for 1918, C. D. Reed (*Iowa Year Book Agr., 19 (1918), pp. 519–595, figs. 5*).—"This report contains the summaries of the monthly and weekly bulletins of the Iowa Weather and Crop Service in cooperation with the Weather Bureau of the U. S. Department of Agriculture for the year 1918."

The mean temperature of the State for the year was 49.2° F., 1.8° above the normal. "All months were warmer than normal, except January, April, July, and September, which were deficient in temperature. The highest temperature, 113°, at Clarinda, on August 4, equaled the 29-year record for the State. The period, July 25 to August 13, was abnormally dry and hot and caused serious damage to the corn crop, particularly over the southwest one-third of the State. The total precipitation averaged 32.78 in., or 0.81 in. above normal. The precipitation was considerably in excess of normal in the north-central counties and markedly deficient in Pottawattamie and adjoining counties.

"The season advanced rapidly in the spring, harvest began about 10 days early, and conditions were favorable for all crops till the heat and drought period above mentioned. Though September was cold, dry, and unfavorable for fall seeding, a large acreage of wheat was seeded, and favorable conditions in the other fall months caused wheat and rye to make good growth and enter the winter in excellent condition. Corn was of excellent quality."

Meteorological records for 1918, F. B. Linfield (*Montana Sta. Rpt. 1918, pp. 173–179*).—Observations at Bozeman, Mont., on temperature, precipitation, humidity, evaporation (April to October), wind, and cloudiness, are reported, and the general character of the weather of the year is discussed.

The mean temperature was 41.3° F., the highest 93° June 10, lowest −32° January 31; total rainfall 18.89 in.; greatest monthly precipitation 2.82 in. in May, least 0.29 in. in December, days with 0.01 in. or more of precipitation 123; number of clear days 104; last killing frost in spring May 29, first in fall October 8. The mean annual temperature was normal. The mean temperature of June was usually high. This month "was also unusual for the number of dry days, low precipitation, and warm winds. It was during this month that dry land crops throughout the State suffered more or less, depending upon the location. . . .

"The State received more than its normal supply of rain during the months of August and September, which furnished sufficient moisture to bring up winter wheat, and this, followed by a warm October, put wheat in an excellent condition. That portion of the State east of the divide was not as dry in 1918 as in 1917, but the failure was more noticeable in 1918 because that portion was included in the dry section of 1917, thus making two failures in succession."

Meteorological records for the years 1917 and 1918, H. L. Price (*Virginia Sta. Rpt. 1918, pp. 61–65*).—Tables are given which show the daily readings of maximum and minimum thermometers at Blacksburg for each month of 1917 and 1918, as well as monthly summaries of temperature, precipitation, wind, and cloudiness for the two years.

SOILS—FERTILIZERS.

The composition and origin of soils, F. F. H. Calhoun (*Com. Fert.*, 19 (*1919*), *No. 5, pp. 50, 52, 54*).—The author discusses plant-forming elements, soil-forming minerals and rocks, and the classification of soils with particular reference to the soils of South Carolina, and gives a classification of the soils of the State with reference to their origin.

It is concluded that soils formed largely of quartz, either in the form of sand or clay, contain no plant nutrients and are, therefore, very infertile, but that soils derived from rock high in potash feldspar content require less potash than soils derived from other rock. Soils derived from limestones are considered to be usually higher in calcium and phosphorus content than soils derived from granite, sandstones, and other common soil-forming rocks, with some exceptions. "Soils of disintegration are usually richer than soils of decomposition. When soils are formed from decomposed rock the original plant food is often lost through solution."

Field operations of the Bureau of Soils, 1915 (seventeenth report), M. Whitney et al. (*U. S. Dept. Agr., Field Oper. Bur. Soils, 1915, pp. 2733, pls. 78, figs. 73, maps 65*).—Supplementing similar work previously noted (E. S. R., 41, p. 317), this comprises a general review of the field work conducted by the Bureau of Soils during 1915, together with detailed reports on 75 surveys which have already been noted from time to time.

During the year 39,626 square miles or 25,360,640 acres were surveyed and mapped in detail, making the total area surveyed and mapped up to January 1, 1916, 393,038 square miles or 251,544,320 acres. Reconnaissance surveys covering an area of 12,607 square miles or 8,068,480 acres were also made.

Contribution regarding two black soil appearances in Germany, K. von See (*Internatl. Mitt. Bodenk.*, 8 (*1918*), *No. 5–6, pp. 123–152*).—This article reports chemical and mechanical analyses and discusses the general characteristics of two soil types in Magdeburg and Mewe. These, it is concluded, are true black soil types, but the soil of the former is a more typical black soil as regards chemical and structural characteristics.

Silting and the origin of Wad and Dollard polders, D. R. Mansholt (*Cultura, 31 (1919), No. 373, pp. 317–329, pl. 1*).—This is a review of different studies and surveys of the polders of Holland with deep and shallow soils, with reference to their formation by silting.

Note on the Nile deposits in Egypt, V. M. Mosséri (*Bul. Union Agr. Égypte, 17 (1919), No. 128, pp. 49–78*).—This report deals with the mechanical, physical, and chemical properties of the three types of alluvial soil of the islands and knolls deposited by the Nile, and discusses their agricultural use.

These soils are divided by mechanical analysis into sandy soils, yellow siliceous clay soils, and black clay soils. The sand soils are the most pervious and have the lowest water-retaining power, while the black clay soils are the most impervious and have the highest water-retaining power. Chemical analyses of the black clay soils and the sandy soils showed that clay soils have a generally higher content of nutritive constituents than the sand soils. In the black clay soils the most nitrogen was found in soil of recent deposition and almost entirely in the organic state. The chlorids were found to be apparently in minimum in the black clay soils, especially those of recent deposition. Calcium and magnesium were more abundant in the soluble salts of the black clay than in those of other cultivated soils. Special studies of the biological properties of the black clay soils showed that under proper conditions nitrification proceeds quite rapidly.

The silt content of the Deli River, S. TIJMSTRA (*Meded. Deli-Proefsta. Medan, 2. ser., No. 7* [*1919*], *pp. 24–29*).—Studies of the monthly transportation of silt for a year by the Deli River are reported.

It was found that the greatest relative silt content occurs in February, April, and December, which corresponds with the time of preparing the soil and planting. It is estimated that the average annual washing of the soil in the stream basin is 2 mm. The average silt content for the year was 0.61 kg. per cubic meter of water, or about three times greater than the amount of dissolved matter.

Water and silt studies of different rivers of Java, L. G. DEN BERGER and F. W. WEBER (*Dept. Landb., Nijv. en Handel* [*Dutch East Indies*], *Meded. Alg. Proefsta. Landb., No. 1* (*1919*), *pp.* [*II*]+*39*).—This is a report on studies of the composition of the river waters and of the influence of the soluble constituents on the soil, on determinations of the quantity of silt in the river waters, on physical and chemical studies of the silt, and on studies of the influence of the physical and chemical properties of the silt on the soil.

It was found that the influence of flooding on soils depends on the composition of the flood water and of its silt, and the composition of the soil. A balance occurs between flood water and soil, determined by the amount of dissolved matter in the water and the amount of soluble matter fixed by the soil. A method is described whereby the influence of flooding a soil with a water of known composition can be determined.

The content of the river waters in dissolved matter varied greatly, being high in the western rivers and low in the eastern rivers of Java. Silicates were prevailingly high in waters from volcanic regions, while lime, sodium sulphate, gypsum, especially, and calcium bicarbonate were high in waters flowing through marl or lime soils. Some waters contained considerable iron oxid, aluminum, and phosphate, and when such waters were acid they contained more iron oxid and aluminum. The potash contents were not usually very great. The waters contained practically no directly injurious constituents such as free mineral acids or chlorids.

Determinations of the silt content of river waters and mechanical analyses of the silts showed that there was no definite relation between grain size and silt content of the water. Generally the silts of the waters with the higher silt content were the coarser. The silt from water nearest the bottom did not always contain the most sand. The granular analyses showed that the volcanic silt consisted mostly of dust, while the marl silt contained large dust and clay fractions. The dust fraction was greatest in the lime soil silts.

The greatest difference in chemical composition of silts from river waters was found in rivers which flow partly through volcanic and partly through marl soils. Greater variations were found in the chemical composition of silt samples from the water surface than from near the bottom. All the silts analyzed contained normal amounts of nitrogen, phosphoric acid, and potash in available form and were rich in lime and magnesia.

It is concluded that no danger or difficulty attends the deposition of this silt on arable soil from the chemical standpoint, with perhaps the exception that the excess lime content might affect the solubility of the phosphoric acid content of the soil. From the physical standpoint it is pointed out that the fine silt should benefit coarse sandy soils, and coarse sandy silt should benefit heavy clay soils. The daily silt determinations showed that a high silt content corresponded with high water.

Ground water movement, E. Kröber (*Internatl. Mitt. Bodenk., 8 (1918), No. 5–6, pp. 105–122, pl. 1, figs. 2*).—A set of experiments lasting two years on the rate of movement of water through soils, to determine the influence of varying size of soil grain, varying stratification, varying head, and temperature, is reported.

Two types of sand soil and a clay soil, and different mixtures of these to obtain different physical and mechanical compositions, were used. The apparatus used was the so-called Thiem apparatus, consisting essentially of a hollow metal cylinder containing the soil column, over which water is maintained at a constant level while the rate and quantity of flow are measured from a beaker supplied by tubing from the bottom of the cylinder. The head is varied by raising or lowering the beaker, and the loss in pressure at different points of the soil column is indicated by three manometer tubes set equal distances apart. The apparatus was filled 12 times, and 490 effective measurements were taken during the period.

It was found in the majority of cases that in the more permeable soils the quantity of flow increases at a slower rate than the effective pressure. This holds good as long as the diameter of soil particles does not exceed 2 mm. and the rate of pressure to length of soil column does not exceed 0.5. All results were reduced to a temperature of 18° C. and the following formulas were derived:

$$v_{18}=\frac{q_{18}}{6.7},\ v^1_{18}=\frac{v_{18}}{p},\ \text{and}\ q_{18}=134he_{18}$$

in which v_{18}=average velocity of flow at 18°, v^1_{18}=actual velocity of flow through the void space, q_{18}=the average quantity of flow per unit of time at 18°, p=the void space, h=the effective head, and e_{18}=the ratio of quantity of flow to effective head. It is concluded that for all soils it may be assumed without great error that a constant relation exists between quantity of flow and effective pressure.

A comparison is made of these expressions with the formulas for velocity derived by Darcy, Seelheim, Slichter, Hazen, and Kröber, it being shown that the Hazen formula more nearly corresponds to the experimental data than any of the others. The Hazen formula is as follows: $v=1{,}000\ J\ d^2_w$, in which v=velocity, J is the ratio of pressure to length of soil column, and d_w is the effective size of soil grain or the width of sieve mesh which will pass exactly 10 per cent of the material.

Further studies showed that the velocity in general increased with decreasing void space and increasing diameter of soil grain. A further mathematical discussion leads to the conclusion that the influence of resistance due to the shape of the void spaces can best be expressed in terms of the total surface of the soil.

Further studies on the condition of soil structure, P. Ehrenberg and J. P. van Zyl (*Internatl. Mitt. Bodenk., 8 (1919), No. 3–4, pp. 41–49*).—This is the second contribution to the subject of mechanical analyses of soils, with particular reference to the influence thereon of drying.

It has been found that with both heavy and light soils, with the exception of light sands, previous drying makes the analysis of the fine soil particles very difficult, it becoming almost impossible by use of customary methods. Artificial drying has a more marked influence in this respect than air drying. A discussion of the reasons for this is included.

The influence of boiling and shaking on fine mineral particles, O. NOLTE (*Landw. Vers. Sta., 93 (1919), No. 5–6, pp. 247–258*).—In studies of procedure in mechanical soil analysis, it was found that shaking of a soil effected a distinct but slight disintegration of the particles. It is concluded that the shaking method, if not carried too far, is a much more reliable means for preparing soils for mechanical analysis than the boiling method.

Geologically important frost phenomena in temperate climates, F. M. BEHR (*Internatl. Mitt. Bodenk., 8 (1918), No. 3–4, pp. 50–72, figs. 2*).—This is a general review of observations made on the effect of alternate freezing and thawing on soils and the resulting cracking and flowing of soils. The question of the effect of freezing and the rising of stones through the soil is also discussed in some detail.

The influence of stones in soil on the growth of plants, T. PFEIFFER and A. RIPPEL (*Landw. Vers. Sta., 93 (1919), No. 5–6, pp. 277–284, pl. 1*).—This is the second contribution to the subject (E. S. R., 41, p. 813), experiments with carrots being conducted on soil containing different percentages of stones.

While the results are apparently considered questionable, it was found that the soil containing the lowest percentage of stones produced the smallest quantity of dry matter. The carrots on the stony soils had the higher water content. It is noted that the carrots during growth exerted considerable pressure in the stony soil without injury to the root or to the production of dry matter. While this can not be explained, the conclusion is indicated that a soil which is constantly saturated with a nutritive solution gives the same favorable growth conditions to plants whether in natural condition or whether broken up by the addition of stones.

The richness of cultivated soils in copper, L. MAQUENNE and E. DEMOUSSY (*Compt. Rend. Acad. Sci. [Paris], 169 (1919), No. 21, pp. 937–942; also in Prog. Agr. et Vitic. (Ed. l'Est-Centre), 40 (1919), No. 50, pp. 561–565*).—An extensive study of the copper content of cultivated soils of widely varying nature is briefly recorded.

It was found that practically all the soils examined contained copper, but in quantities varying widely with the method of cultivation. Soils growing grapes invariably contained much greater amounts of copper than other cultivated types. This is apparently due to the treatment of the vines with compounds containing copper. However, there was considerable variation in the copper content of grape-growing soils, the finer grained soils always containing the most copper. The lime content of the soils is also thought to influence their copper content.

Activity of soil acids, R. E. STEPHENSON (*Soil Sci., 8 (1919), No. 1, pp. 41–59*).—In studies conducted at the Iowa Experiment Station, the rate of reaction of soil acids in different soils was compared. This in turn was compared with the rate of reaction of the acidity of buffered solutions of known hydrogen-ion concentration.

None of the first soils used were high in organic matter. Titrations were made at various intervals, the blank on the soil and reagents being subtracted each time so that the results showed the relative reactivity of the different fractions of acidity.

It was found that "the modified Tacke method is capable of adaptation to determinations of the relative activities of different fractions of soil acidity. The more reactive acids, those capable of giving a toxic concentration of hydrogen-ion, react rather quickly. This has been proved by the application of lime to acid soil in successive increments and applying a qualitative test to determine at what stage a neutral soil reaction may be obtained. Soils may contain a large reserve of acidity, which might be described as potential rather than active, but which is, nevertheless, capable of slowly decomposing carbonates.

"Rather highly buffered solutions react rapidly with calcium carbonate even in the presence of soil, indicating that even the more active fractions of the soil acids may be considerably buffered. Protein materials and amino acids so far as tested, previous to decomposition in the soil, do not react readily with carbonates.

"Knowledge of acid soils is considered more adequate when something is known of the activity of the acids, as well as of the total potential acidity, commonly determined, more or less inaccurately. It is not the capacity of a soil to decompose lime, but rather the intensity of decomposition, which is most highly significant."

Soil acidity.—II, Its relation to the acidity of the plant juice, E. Truog and M. R. Meacham (*Soil Sci., 7 (1919), No. 6, pp. 469–474*).—This is the second contribution to the subject (E. S. R., 39, p. 513), in which studies were made at the Wisconsin Experiment Station on the hydrogen-ion concentration of the juices from alfalfa, clover, blue lupine, soy bean, buckwheat, corn, and rape, grown on limed and unlimed, medium to strongly acid soils, and on neutral soils. No final conclusions are drawn.

It was found, however, that on the limed and unlimed acid soils, in only two cases out of six with alfalfa and in the case of lupine were the plant juices more acid on the limed series. In the other 12 cases the plant juices were more acid on the unlimed series. In the two reversed cases of alfalfa the differences were quite small. It is noted that the acidity of both the limed and unlimed alfalfa in these cases was quite high for alfalfa, and that evidently, even in the limed series, the plants were not getting sufficient lime. In the series on a rich neutral soil, the data emphasized the importance of standardizing the conditions of making the acidity determinations.

Three comparative sets of experiments to study the question as to whether or not the roots and tops of the same plant are of the same acidity showed that in two cases the roots were slightly more acid than the tops, and that the opposite was true in the third case.

It is decided that before final conclusions can be drawn much more investigation is needed, and that the proper method of carrying on this investigation, especially the technic of making the acidity determinations, needs to be standardized.

Fixation of phosphoric acid in soils (*Virginia Sta. Rpt. 1918, p. 10*).—The continuation of the study to correlate crop yield with the amount of phosphoric acid dissolved from soil by the fifth-normal nitric acid method (E. S. R., 39, p. 22) has shown that the effect of the addition of lime is very marked. The phosphoric acid content of the soil showed no increase according to the fifth-normal nitric acid test, but the crop yield continued to increase, showing that the beneficial effects of lime must be due either to an increase of available phosphoric acid and potash not indicated by the solvent or to a better physical condition induced in the soil by the lime. Similar results were found on a series of plats growing wheat, from annual applications of lime with and without manure, acid phosphate, and floats.

Further studies on the distribution and activities of certain groups of bacteria in California soil columns, C. B. Lipman (*Univ. Cal. Pubs. Agr. Sci., 4 (1919), No. 4, pp. 113–120; abs. in Abs. Bact., 3 (1919), No. 4, p. 209*).—

From studies of auger borings at various depths down to 7 ft. in a number of different soils, it was found that previous findings (E. S. R., 27, p. 822) to the effect that microorganisms of arid soils penetrate deeply into the subsoil layers, were confirmed.

It was demonstrated that ammonification continues undiminished through 6 ft. of soil in every case. While this was not true for the nitrifying powers of the same soils, it is considered clear that nitrifying bacteria do live in the lower layers of some, and perhaps of all, of the soils to similar depths. The great difference between the two is attributed to the fact that the nitrifying power of these soils diminishes rapidly downward from the first foot, while the ammonifying power remains apparently unchanged. The nitrogen fixation results were for the most part inconclusive, but seemed in general to confirm the idea that bacteria and other microorganisms do penetrate to greater depths in arid soils than would be generally expected. Such penetration and activity at those depths seem to be superior to those noted on humid soils.

The oxidation of vanillin to vanillic acid by certain soil bacteria, W. J. Robbins and E. C. Lathrop (*Soil Sci., 7 (1919), No. 6, pp. 475–485, fig. 1*).—Studies are reported which were conducted jointly by the Alabama College Experiment Station and the U. S. Department of Agriculture. These studies show that in solution cultures, consisting of pure inorganic salts and vanillin as the only source of carbon, vanillin is oxidized by pure cultures of the vanillin-destroying bacteria isolated from the soil. The vanillic acid formed at first accumulates in the culture medium, but is later destroyed.

The nitrogen supply of soils and the action of straw and sugar, O. Lemmermann and A. Einecke (*Landw. Vers. Sta., 93 (1919), No. 5–6, pp. 209–220, pls. 5*).—Studies on the nitrogen content of soils as influenced by stable manure and artificial fertilizers alone and in combination are reviewed, and pot experiments with various cereals, including oats, mustard, and Italian rye grass, are reported, to show the influence of straw, sugar, liquid manure, and sodium nitrate, alone and in different combinations.

It was found that the addition of 2 per cent of sugar to the soil decreased the oats crop, but in succeeding years a slight increase was obtained. The increase due to sugar was always small and less than that due to sodium nitrate, but was approximately equal to that due to liquid manure. The addition of straw to the soil in amounts equal to the sugar additions decreased the crop in the first two years, but gave a small increase in the third year, the total effect being negative. The injurious effect of the straw was neither removed nor diminished by the addition of either sugar or liquid manure or both, but was removed by sodium nitrate. The results confirmed the view that fresh straw should be removed as completely as possible from arable land and that no improvement in the nitrogen economy of the soil is to be expected from its use.

Effect of alfalfa on the fertility elements of the soil in comparison with grain crops, C. O. Swanson and W. L. Latshaw (*Soil Sci., 8 (1919), No. 1, pp. 1–39, fig. 1*).—A large number of experiments conducted at the Kansas Experiment Station are reported, in which the general plan was to sample the soils from old alfalfa fields and other fields nearby which were of the same type of soil but had been continuously in cultivation or in native sod, and to analyze the samples for nitrogen, organic carbon, inorganic carbon, phosphorus, and calcium. Preference was given to those locations where all of the types of field mentioned were close enough together for direct comparison. Samples were generally taken at four depths, 0 to 7 in., 7 to 20, 20 to 40, and 40 to 80 in. For purposes of comparison, the State was divided into three sections, humid, subhumid, and semiarid. The basis of division was the average annual rainfall. All samples taken from localities where the rainfall is 30 in. or more were classed as from the humid section; those from localities where the rainfall is between 30 and 22 in., as from the subhumid section; and those from localities where the rainfall is less than 22 in., as from the semiarid section.

It was found that in the humid section the surface of the cropped soil had lost one-third of the nitrogen as compared with the surface soil of the native sod. The fields in alfalfa contained 14.8 per cent less nitrogen than the native sod, and 21.6 per cent more than those fields which had been cropped to grain. In the subsurface 7 to 20 in., the changes due to cropping were much less than in the surface, and in the subsoils there were no changes that could be attributed to the methods of cropping.

In the subhumid section the fields cropped to grain lost one-fourth of the nitrogen as compared with the surface soil of the native sod. The alfalfa fields contained 5 per cent less nitrogen than the native sod, but 20 per cent more than the fields in grain. In this section the changes due to cropping were also confined to the surface and subsurface.

In the semiarid section the cropped soil lost one-fifth of the nitrogen as compared with the native sod. Alfalfa fields contained 15.7 per cent more nitrogen than the soils in native sod, and 30 per cent more than the soils continuously cropped. In this section the significant changes were confined to the surface soil. This comparison showed that there is an unmistakable gain in nitrogen of the soils in the semiarid section. This is attributed in part at least to a greater loss of leaves in curing alfalfa in the arid section.

It is concluded that the continuous growing of alfalfa may not increase the nitrogen content of the soil. The increased crop production which is usually obtained on alfalfa fields when they are plowed up is probably due to the large amount of available nitrogen they contain.

In the humid section, the cropped soils lost 36 per cent of the organic carbon present in the virgin sod and those in alfalfa over 21 per cent. The fields in alfalfa contained 18 per cent more than those continuously cropped to grain. In all sections the changes in the organic carbon content were confined to the surface soil, with one exception. In the humid section, the subsurface of the native sod had a significantly higher carbon content than the alfalfa or cropped soil. In the subhumid section the cropped soils lost 28 per cent of the original carbon content and the alfalfa soils 13 per cent. In the semiarid section the cropped soils contained 30 per cent less carbon than the virgin soils and the alfalfa soils 10 per cent less. In this section the changes in carbon content differed fundamentally from the changes in nitrogen, which showed a gain.

The phosphorus content of the cropped soil was lower than that of the alfalfa soil, or soil in native sod. Alfalfa removed more phosphorus from the soil than grain crops. The fact that the alfalfa fields did not show a lower phosphorus content than the soils in native sod is taken to mean that there has been a transference of phosphorus from the subsoil to the surface. In the humid section, the surface of the cropped soil contained the same amount of phosphorus as the subsoils. In all other cases, the phosphorus content of the surface soil was higher than that of the subsoils. This would point to a definite lowering of the phosphorus content of the cropped soil in the humid section.

In the subhumid and semiarid sections, most of the soils contained 1 per cent and more of calcium and nearly all had some calcium in the carbonate form. In the humid section, alfalfa was found growing on four soils successfully in which the calcium content was less than 0.5 per cent. The calcium content in most soils varied from 0.5 to 1 per cent, and in the majority the carbonate form of the calcium was absent.

The effect of green manuring on soils (*Virginia Sta. Rpt. 1918, pp. 11–13*).—Continuing experiments previously noted (E. S. R., 39, 826), the effect of turning under green manuring crops at different stages of growth on $\frac{1}{11}$ acre plats was studied. The green crops used were rye, oats, crimson clover, and vetch, one-half of each plat being cut for hay and the other half turned under.

Poor stands of grasses were obtained during the first year, with the exception of rye. The sand of millet was especially poor on plats receiving vetch as a green manure treatment. It is stated, in general, that material turned under prior to June 1 had little effect on the yield of millet.

During the following year wheat was grown and the stubble fallowed. No marked differences in the yield of wheat were observed on the cut and turned plats.

Studies of the chemical composition of the cover crops at various stages of growth indicated a diminution of protein throughout the cutting period with rye, and also a slight decrease in fat and an increase in crude fiber and carbohydrate. Very little change was noted in the composition of oats, vetch, and clover, with slight exceptions.

Studies on the nitrogen content of liquid manure.—I, The transformation and loss of nitrogen in urine and liquid manure, E. Blanck (*Landw. Vers. Sta., 91 (1918), No. 3–4, pp. 173–221*).—This is the first of a series of reports on the subject, the remaining numbers of which have been previously noted (E. S. R., 41, p. 721).

In this number experiments are reported which showed that the fermentation of urine proceeds under all conditions, either in the presence or absence of air or with the use of an acid as a preservative. The course of the transformation of urine is varied somewhat in intensity, speed, and duration, but in the end the result is about the same and no action on the releasing of nitrogen in the form of ammonia is obtained. Also, excremental bacteria had no special influence on the release of ammonia nitrogen. Evaporation alone of liquid urine caused considerable nitrogen losses, and it appeared probable that nearly all otherwise noted losses of ammonia nitrogen can be ascribed to evaporation of liquid urine. While the mere exclusion of air has no effect, the effect of exclusion of air on prevention of evaporation is considered to be the main feature in such practice in the conservation of the nitrogen of liquid manure and urine.

Nitrogen losses in urine, F. E. Bear and J. R. Royston (*Jour. Amer. Soc. Agron., 11 (1919), No. 8, pp. 319–326*).—Experiments conducted at the Ohio State University are reported on the nitrogen losses from urine (1) exposed to the open air, (2) in Bunsen valve flasks, (3) in closed flasks, (4) in closed flasks with the air displaced with carbon dioxid, (5) absorbed in litter, and (6) protected by layers of kerosene.

It was observed that urine exposed to the air lost over 92 per cent of its nitrogen over a period of 8 weeks under temperatures averaging 38° C. (100.4° F.). Under temperatures averaging 5° less, approximately the same losses occurred over a period of 12 weeks. For shorter periods of time the losses were somewhat smaller at the lower temperatures. With urine not exposed to the air practically no losses took place under the various conditions of temperature, time, and methods of control.

The effectiveness in preventing nitrogen losses by absorption of the urine in litter depended upon the method of handling the litter. Litter which was allowed to dry out and remain dry lost approximately 20 per cent of its nitrogen content. On the other hand, litter kept in a moist condition by the daily addition of water lost over 97 per cent of its nitrogen, the greatest loss which occurred in any of the samples.

Kerosene proved a fairly satisfactory means of preventing nitrogen losses. The samples of urine so protected lost approximately 6 per cent of their nitrogen content over a period of 8 weeks.

A list of seven references to literature bearing on the subject is given.

Peat in 1918, C. C. Osbon (*U. S. Geol. Survey, Min. Resources U. S., 1918, pt. 2, pp. IV+331–356, pl. 1, fig. 1*).—This report deals with the production and use of peat in the United States and in foreign countries during 1918.

It is stated that the greatest activity and expansion in the history of the domestic peat industry took place in 1918. The quantity of crude air-dried peat produced in the United States in 1918 was 151,521 short tons. This was 54,158 tons, or nearly 56 per cent, more than the record output of 97,363 tons in 1917.

"The largest and most successful branch of the peat industry is engaged in the production of peat for a direct fertilizer and for a nitrogenous ingredient of commercial fertilizers. Of the 25 plants that produced peat in 1918, 19 used air-dried peat in the manufacture of fertilizer, the quantity of peat utilized . . . being 79,573 short tons. Compared with the output in 1917 this quantity is less by 12,690 tons, or about 14 per cent, but it exceeds the quantity used in 1916 by 31,467 tons, or about 65 per cent. . . . Of the total quantity of peat used in manufacturing fertilizer in 1918, 7,356 tons, valued at $64,170, or about $8.72 per ton, was bacterized. . . . The largest use of peat in the United States for the cultivation of crops, exclusive of the direct cultivation of peat soils, is in the form of a nitrogenous ingredient of commercial fertilizers."

The synthesis of ammonia under very high pressures, G. Claude (*Compt. Rend. Acad. Sci. [Paris], 169 (1919), No. 22, pp. 1039–1041, fig. 1*).—The author reports studies on the synthesis of ammonia under high pressures varying from 200 to 1,000 kg. per square centimeter (1.4 to 7 tons per square inch). The results show the ease with which the combination of nitrogen and hydrogen is effected under very high pressures. Nevertheless, the use of an appropriate catalytic agent is deemed indispensable.

Transformation of cyanamid into urea by soil microorganisms, P. Mazé and V. and M. Lemoigne (*Compt. Rend. Acad. Sci. [Paris], 169 (1919), No. 20, pp. 921–923*).—Experiments on the transformation of cyanamid into urea by a number of the common abundant types of soil and water organisms are reported.

It was found that these organisms, including especially *Bacillus prodigiosus*, *B. cloacæ*, *B. subtilis*, and other common types, are capable of transforming the cyanamid into urea. It is concluded that in a fertile soil, rich in humus, cyanamid changes rapidly into urea, but that in acid soils this transformation is necessarily much slower. It is further concluded that the urea formed is immediately changed into forms of nitrogen which are available to crops.

Action of cyanamid and dicyandiamid on the development of corn, P. Mazé and V. and M. Lemoigne (*Compt. Rend. Acad. Sci. [Paris], 169 (1919), No. 18, pp. 804–807, fig. 1; abs. in Jour. Soc. Chem. Indus., 38 (1919), No. 23, pp. 918A, 919A*).—Experiments on the influence of calcium cyanamid and dicyandiamid, both when used alone and when combined with sodium nitrate, are reported.

The cyanamid and dicyandiamid were added to solution cultures of corn in amounts of 0.162 gm. per liter of solution. This is considered to be equal, with reference to nitrogen content, to an addition of 0.5 gm. of sodium nitrate per liter of solution.

It was found that cyanamid with or without sodium nitrate killed the young plant, which died within 48 hours when under the sun. The dicyandiamid did not kill the plant, but its nitrogen content was apparently unavailable to the plant and the results obtained were no better than those obtained in distilled water cultures. When sodium nitrate was used with dicyandiamid there was apparently normal growth of the plant, showing that the dicyandiamid was not toxic.

Effect of oxidation of sulphur in soils on the solubility of rock phosphate and on nitrification, O. M. SHEDD (*Jour. Agr. Research* [*U. S.*], *18* (*1919*), *No. 6*, *pp. 329–345*).—This article, a contribution from the Kentucky Experiment Station, reports investigations made at that station with composts of rock phosphate (100 lbs.), sulphur (50 lbs.), soil (325 to 475 lbs.), and manure (25 lbs.), in which it was found that after about 24 months' time about 17 per cent of the total phosphorus had been made water-soluble and 84 per cent ammonium-citrate-soluble. Good results in rendering the phosphorus soluble were obtained with composts containing no sulphur, but not so good as with those to which sulphur had been added. The time of sulphofication was reduced nearly one-third by inoculating the composts with sulphofying organisms, but inoculation alone was not sufficient to promote rapid sulphofication in mixtures of rock phosphate and sulphur. It was necessary to add also soil or soil water. Sulphofication varied somewhat according to the type of the soil.

The results indicate that the production of soluble phosphate was due to the sulphuric acid formed by the oxidation of the sulphur, the best conditions for the reaction being initial inoculation, high temperature, thorough aeration, and a fair moisture content. "Taking into account the cost of materials, the compost containing the larger amount of soil and some manure proved more desirable.

"The acid phosphate made by this procedure has just as good physical condition as the commercial product, and would be cheaper if the time and labor involved in its manufacture are disregarded."

Nitrification was found to proceed to a certain extent regardless of the acid formed by the oxidation of the sulphur, approximately 20 per cent of the total nitrogen present being nitrified. There was apparently some fixation of nitrogen from the air by the composts.

A list of 14 references to literature relating to the subject is given.

Composting phosphate rock and sulphur (*Virginia Sta. Rpt. 1918*, *pp. 10, 11*).—Chemical analyses of composted soil previously inoculated with sulphofying bacteria, raw rock phosphate, and sulphur showed that during the period of a year 20 per cent of the phosphoric acid in the raw rock phosphate was made available. In the compost without sulphur the availability of the phosphoric acid was not increased.

The selection of phosphatic manures (*Indian Tea Assoc., Sci. Dept. Quart. Jour.*, *No. 3* (*1919*), *pp. 95–99*).—This is a review of the results of several different sets of experiments on the use of phosphatic manures on Indian soils. These indicate, as a whole, that when applied to an unlimed soil bones are the most economical form of phosphatic manure, and that the efficiency of bones on a limed soil is about the same as that of basic slag. It is also noteworthy that the comparative efficiencies of the three forms of bone phosphate used depend upon the fineness. Superphosphate on unlimed soil has an efficiency much less than that of basic slag, and its continued use on an acid soil is considered harmful. When lime is occasionally applied, the efficiency of superphosphate is said to be equal to that of basic slag, even on acid tea soils.

Some phosphate beds of Galicia, Podolia, and Palestine, V. Simonelli (*Italia Agr., 56 (1919), No. 10, pp. 289–303, figs. 9*).—In this review and summary of the status of certain phosphate deposits in Galicia, Podolia, and Palestine, it is stated that analyses of the Galician deposits have shown a content of calcium phosphate of 71.26 per cent. Analyses of the phosphate deposits of Podolia have shown an average content of tricalcium phosphate of 70 per cent. Analyses of the Palestine deposits have shown a tricalcium phosphate content varying from 20.03 to 41.24 per cent.

Data on the use of rock phosphate are given.

The phosphate deposits of South Australia, R. L. Jack (*Geol. Survey So. Aust. Bul. 7 (1919), pp. 136, pls. 5, figs. 37*).—This is stated to be a rather superficial review of the possibilities of the phosphate industry in South Australia, made on the basis of an examination of about 50 widely separated deposits. A large amount of general information relating to the value of phosphorus in agriculture, the manufacture of superphosphate, the utilization of low-grade phosphate, the geology of phosphate deposits, methods of working rock phosphate, and treatment of rock phosphate, is given. Analyses of a number of samples of rock phosphate showed a content of tricalcium phosphate varying from 80.48 to about 80 per cent.

The manurial value of a modification of orthoclase-bearing rock where only potassium was deficient, B. L. Hartwell (*Jour. Amer. Soc. Agron., 11 (1919), No. 8, pp. 327–329*).—A field experiment conducted at the Rhode Island Experiment Station on a so-called rock potash fertilizer, containing 3.87 per cent water-soluble potash, and manufactured from lime and feldspathic rock as a source of potash, is reported.

The experiment was conducted with potatoes and alfalfa on sandy loam soil, and the fertilizer was compared with potassium sulphate and potassium chlorid. It was found that under neutral conditions, which were believed to be suboptimum for potassium only, the rock potash fertilizer was slightly more efficient than high-grade potassium chlorid or potassium sulphate when supplying the same amount of water-soluble potassium.

The potash salts of the Punjab Salt Range and Kohat, M. Stuart (*Rec. Geol. Survey India, 50 (1919), pt. 1, pp. 28–56, pls. 8, figs. 2; abs. in Econ. Geol., 14 (1919), No. 8, pp. 645, 646*.—A reexamination of the salt deposits of the Kohat district and Punjab Salt Range led to the conclusion that no continuous beds of potash will be found in either district, and that potash will not be produced from these deposits except possibly as a by-product in mining salt.

A new potash supply, E. G. Bryant (*Jour. Soc. Chem. Indus., 38 (1919), No. 19, pp. 360T–362T*).—This article deals with the extent and possibilities of certain potassium-nitrate deposits occurring in mountainous parts of South Africa.

The largest and best-known niter bed is that at Prieska on the Orange River in the northwest part of Cape Colony. The origin of this postassium nitrate is ascribed to the action of the excrement of rock-rabbits on potash-bearing rocks. Analyses of typical samples showed potassium nitrate contents varying from 1.2 to 25.88 per cent. Methods of commercial utilization are discussed.

The mineral riches in Alsace-Lorraine, L. de Launay (*Rev. Sci. [Paris], 57 (1919), No. 22, pp. 673–686, figs. 5*).—This is a report on the status of the iron, coke, potash, and petroleum resources of Alsace-Lorraine.

With reference to the potash resources, it is stated that there is an area bounded by Metenheim on the north, Reiningen on the south, Sausheim on the east, and Sennheim on the west, in which there are two separate layers of potash deposits. The upper layer is about 1.15 meters (3.77 ft.) in thickness and the lower about 4.15 meters. It is estimated that the upper layer contains about 98,000,000 cubic meters (128,184,000 cu. yds.) of deposits covering about 84 sq. km. (32.4 sq. miles). The lower layer is estimated to contain about 603,000,000 cubic meters and to cover 172 sq. km. It is estimated that there are available about 1,500,000,000 tons of crude potash salts.

Partial sterilization of soils by applications of lime, F. Watts (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. St. Kitts-Nevis, 1917–18, pp. 26, 27*).—Experiments on the partial sterilization of soil by lime, using tomatoes and tobacco, are reported.

It was found that 100 gm. of soil required 0.7 gm. of calcium oxid to bring about partial sterilization. Great difficulty was experienced in establishing the plants in the limed soil. At first the growth of plants in the unlimed soil was much more rapid than that of plants in the limed soil. The root stems of plants grown in the limed soil were much larger than those of plants grown in the unlimed soil. The general appearance of the plants in the limed soil was the better, they being very green while those in the unlimed soil were inclined to be yellow.

Relation between liming and the acidity of moor soils, Densch (*Mitt. Ver. Förd. Moorkult. Deut. Reiche, 37 (1919), No. 5, pp. 49–56*).—Experiments with heather soil, mossy peat, and upland and lowland moor soils in process of transformation showed that almost twice as much lime was required to neutralize the heavy heather soil as the mossy peat soil, although the acidity of the latter was estimated to be about 23 per cent greater than that of the former. The amount of lime required to neutralize the lowland soil was also considerably greater than that required by the upland soil, although their degrees of acidity were apparently the same.

Pot experiments with oats, barley, and rye on these soils showed that with the heather soil and the upland mossy peat soil the best results were obtained when sufficient lime was added to neutralize three-eighths of the estimated soil acidity. This was especially the case for rye and barley, while it was found that with oats practically as good results were obtained with one-fourth of the estimated acidity neutralized.

With the upland and lowland moor soils, it was found that the yield increased slightly until sufficient lime was added to neutralize about three-fourths of the estimated soil acidity, and then decreased.

As a result of these experiments, it is recommended that about 4,000 kg. per hectare (3,560 lbs. per acre) of lime be used on the upland moor soils, and that only a limited amount of lime be added to transition moor soils.

Acid soils and the toxicity of manganese, M. J. Funchess (*Soil Sci., 8 (1919), No. 1, p. 69*).—Studies conducted at the Alabama College Experiment Station, on plat soils and on soils from various places in Alabama, indicate that the conclusion contained in Bulletin 201 of the station (E. S. R., 39, p. 627) that soluble manganese produced by the action of nitrogenous fertilizers was the cause of toxicity of these soils, is untenable. It has been found that the addition of manganese carbonate to such toxic extracts has produced conditions favorable to the growth of seedling pea roots in every instance. Acid soils, when incubated with dried blood and manganese carbonate, gave extracts which contained more soluble manganese than when incubated with dried blood alone but were not nearly as toxic. The injury resulting from large amounts of manganese under these conditions was more apparent on the leaves than on the roots of seedlings. Moderate amounts of soluble manganese in extracts of soils incubated with dried blood and manganese carbonate caused no apparent injury to either roots or tops of pea seedlings.

Further details are to be published later.

Analyses of commercial fertilizers, fertilizer supplies, and home mixtures, C. S. CATHCART ET AL. (*New Jersey Stas. Bul. 337* (*1919*), *pp. 5–53*).—This bulletin reports the results of actual and guarantied analyses of 690 samples of fertilizers and fertilizer materials collected for inspection in New Jersey during the spring of 1919. The different types of samples are discussed with reference to composition. It is noted that of four samples of potash, representing materials from different sources, the cost of the water-soluble potash varied from 22.7 to 29 cts. per pound.

Proceedings of the twenty-sixth annual convention of the National Fertilizer Association (*Proc. Ann. Conv. Natl. Fert. Assoc.*, *26* (*1919*), *pp. 100, figs. 5*).—This is a report of the proceedings of the convention of the association at New London, Conn., during the week of June 23, 1919.

AGRICULTURAL BOTANY.

American food plants, past and present, compared with those from other countries, J. W. HARSHBERGER (*Univ. Penn., Univ. Lectures, 5* (*1918*), *pp. 215–232*).—This is mainly a survey, from the point of view of war conditions, of food plants, past and present, with special reference to native American food-producing plants. The treatment includes, however, first, the food plants used in Europe before the discovery of America; second, the food plants of the American continents introduced into general cultivation since the European occupation of North America; third, the prominent food plants which by their peculiar fitness as African, American, Asiatic, European or Sea Island plants, have survived and have continued in use.

Development of the pistillate spikelet and fertilization in Zea mays, E. C. MILLER (*Jour. Agr. Research* [*U. S.*], *18* (*1919*), *No. 5*, *pp. 255–266, pls. 14*).—In a contribution from the Kansas Agricultural Experiment Station, the author gives the results of cytological studies of the pistillate spikelet and the flower of the corn plant (*Z. mays*), the work being undertaken with the idea of obtaining cytological data on some of the more common crop plants.

Studies on fruit and seed formation in crossings within the genus Primula, E. DE VRIES (*Rec. Trav. Bot. Néerland.*, *16* (*1919*), *No. 2*, *pp. 63–205, pls. 2*).—The results of the study here described as regards fertilization, fruit-setting, and other features in crossings within the genus Primula are given in tabular detail with discussion.

After-ripening and germination of seeds of Tilia, Sambucus, and Rubus, R. C. ROSE (*Bot. Gaz.*, *67* (*1919*), *No. 4*, *pp. 281–308*).—It is stated that air-dry seeds of *T. americana*, *S. canadensis*, and *R. idæus* do not germinate on moist substratum at room temperature. Water absorption does not appear to be the limiting factor. Air-dry seeds planted in soil over winter give low germination percentages.

Studies on the leaf anatomy of alpine and of plains plants, P. L. LOHR (*Rec. Trav. Bot. Néerland.*, *16* (*1919*), *No. 1*, *pp. 1–62, figs. 8*).—This is a study of alpine and plains plants as regards leaf anatomy, or more particularly as regards leaf thickness as modified by exposure, by elevation, and by the chemical characters of the soil; epidermal characters as regards superficial leaf layers and stomata; mesophyll structure as regards the influence of exposure and moisture; the relation between percentages of isolated and of dorsiventral leaves; intercellular volumes; the relation between fresh weight and dry weight; and anatomical characters of plants in certain types of situation.

Basis of succulence in plants, D. T. MACDOUGAL, H. M. RICHARDS, and H. A. SPOEHR (*Bot. Gaz.*, *67* (*1919*), *No. 5*, *pp. 405–416*).—A study has been made of

Castilleia native to the region around the Coastal Laboratory, at Carmel, Cal., including two forms, one having thin leaves and growing in the open forest formation, the other having fleshy leaves and growing on sandy foreshores under arid but not saline soil conditions.

The thickness of the succulent leaves is due to the enlargement of the elongated cells which are perpendicular to the leaf surface. Other differences are indicated, and further observations are noted, in particular the case of Castilleia, which presents an example of thin leaves becoming succulent under conditions which favor the transformation of polysaccharid to pentose in other plants. It is thought that, instead of acidity being a direct result of succulence, it may be characteristic rather of plants presenting a metabolic complex favorable to pentose formation and to the development of succulence under certain environic conditions.

Colloidal reactions fundamental to growth, D. T. MacDougal (*Abs. in Science, n. ser., 51 (1920), No. 1307, pp. 69, 70*).—Attention is called to the absorption capacity of living cell masses from growing parts of plants as well as dry dead sections of the same material. The comparative swellings in acid and basic solutions in the two cases are quite different, probably due to changes in the colloids caused by the adsorption of salts. Artificial mixtures of pentosans, agar, mucilage, and gum, and of plant albumins made up to simulate as far as possible the composition of plasmatic colloids show comparative hydrations or total swelling similar to cell masses. Some of the results obtained, the author claims, are not explainable on the basis of the simple action of the H- or OH-ions, especially in the use of alkaline hydroxids, ammonia, and amino-compounds.

The localization of chemical work in the plant, A. Tschirch (*Schweiz. Apoth. Ztg., 56 (1918), Nos. 13, pp. 162–164; 14, pp. 173–177; 15, pp. 185–189*).—The author concludes this discussion with the statement that primitive materials are formed in the assimilative tissues and carried thence to points where they are to be utilized or stored. Waste products are laid down in epidermis, cork, or the sheaths of the vascular bundles, and also partly in physiologically dead portions of the pith. The secretions arise in the membranous layer lining local containers of secretions.

Organic balance in plants, G. Nicolas (*Bul. Soc. Hist. Nat. Afrique Nord, 9 (1918), No. 3, pp. 62–65*).—Studies with vetch and bean on the rôle of chlorophyll in respiratory phenomena are said to have shown that physiological compensation or balance in case of suppression or removal of plant organs is more complete than might be inferred from work of Boirivant (E. S. R., 10, p. 228). The suppression of leaves influences strongly morphological modification and the physiology of respiration. Respiratory activity in the petiole and in the stem may approach the normal rate of the uninjured leaves.

Organic carbon nutrition of plants.—Parallel between fungi and green plants, T. Bokorny (*Centbl. Bakt. [etc.], 2. Abt., 47 (1906), No. 1–9, pp. 191–224; 47 (1917), No. 10–15, pp. 301–375*).—This is a study in considerable detail, as regards observations and deductions, of parallels or contrasts between fungi and green plants.

The alleged storing of fat by evergreen foliage, A. Meyer (*Ber. Deut. Bot. Gesell., 36 (1918), No. 1, pp. 5–10*).—The author was able to demonstrate in leaves of certain evergreens the presence of droplets which are discussed under the name mesophyll secretion.

The function of vitamin in the metabolism of Sclerotinia cinerea, J. J. Willaman (*Abs. in Science, n. ser., 51 (1920), No. 1307, pp. 70, 71*).—The author claims that the brown-rot fungus will not grow normally on purely synthetic media, but that when these media are supplemented by additions of vitamin normal growth occurs. Vitamins were prepared by adsorption on fuller's earth from a large variety of materials, and those materials which are characterized by high respiratory activity gave the most active vitamin preparations, both for vegetative growth and for reproduction. The author believes as a result of his investigations that the vitamin in question is universally distributed in plant and animal tissues, and that it plays an essential part in the respiratory process. The evidence is said to favor the view that this vitamin is the water-soluble antineuritic B.

Studies in the metabolism of Actinomycetes, S. A. Waksman (*Jour. Bact., 4 (1919), No. 3, pp. 189–216*).—Experiments conducted at the New Jersey Experiment Stations on organisms isolated from soil are reported.

It was found that blood agar forms a good medium for the growth of Actinomycetes. The production of a dark pigment by some and a clear zone, indicating hemolysis, by others is characteristic. Loeffler's blood serum forms a good medium for the growth of Actinomycetes; the liquefaction of the serum by some and the production of a dark brown to black pigment by others are distinctive properties of some of these organisms. The organisms that produce hemolysis and liquefy the blood serum are among the ones that can produce active proteolytic enzyms.

Cultural studies of species of Actinomyces, S. A. Waksman (*Soil Sci., 8 (1919), No. 2, pp. 71–215, figs. 29*).—General and comparative cultural and biochemical studies of a large number of Actinomycetes, including over 300 isolations, are reported, which were conducted at the New Jersey Experiment Stations.

It was found that the following media can be recommended for a starting point in studying and in identifying the different species: (1) Synthetic agar No. 1 and glucose agar (Krainsky's) as standard synthetic media—temperature of incubation 22 to 25° C., period of incubation 7 to 15 days; (2) gelatin, 15 per cent, in distilled water, reaction unadjusted—temperature of incubation 16 to 18°, period of incubation, 30 days; (3) skimmed milk—temperature of incubation 25° and 37°, observations to be made daily; (4) potato plugs at 25° for 7 to 15 days; (5) starch agar at 25° for 10 to 15 days, test for diastatic power; (6) nutrient agar, 25° for 7 to 15 days (optional); (7) tyrosin solution, 25° for 15 to 20 days (optional); and (8) Loeffler's blood serum, 37° for 7 to 15 days (optional).

In addition a detailed description of the different species is given, together with a key to the identification of the Actinomycetes.

North American Ascochytæ, J. J. Davis (*Trans. Wis. Acad. Sci., Arts, and Letters, 19 (1919), pt. 2, pp. 655–670*).—This is a descriptive list with host index of the species of Ascochyta as distinguished from related forms, some of which have been placed in other genera.

Note on the flagellation of the nodule organisms of the Leguminosæ, R. Hansen (*Science, n. ser., 50 (1919), No. 1303, pp. 568, 569*).—Additional studies of flagellation of the nodule bacteria have confirmed previous conclusions regarding them (E. S. R., 37, p. 819).

Cultures from *Vigna sinensis* and *Glycine hispida* have shown that the organisms possess a single polar flagellum. Pure cultures from the nodules of *Trifolium pratense, Vicia villosa,* and *Melilotus alba,* when stained showed that the bacteria in every case were peritrichous. It was further found that the organisms from Vigna and Glycine have a stout flagellum, while the flagella of the organisms from Vicia, Trifolium, and Melilotus are much finer. Based on the flagellation, the author claims the nodule bacteria may be divided into two distinct groups, the Glycine-Vigna group, and the Trifolium-Vicia-Melilotus group.

Wound calluses and bacterial tumors, W. Magnus (*Ber. Deut. Bot. Gesell., 36 (1918), No. 1, pp. 20–29*).—Studies carried out with carrots are described as showing a probability that, although *Bacterium tumefaciens* may be very widely distributed in nature, it is seldom able to induce tumor outgrowths without a special tendency thereto on the part of the host plant. This may be produced by wounding and exposure to the organism in abnormally large numbers.

The influence of low temperature on soil bacteria, A. F. Vass (*New York Cornell Sta. Mem. 27 (1919), pp. 1043–1074*).—The results are given of an investigation carried on to determine whether there was actual growth and reproduction of bacteria in frozen soils or solutions; what is the effect of low temperature on *Bacillus radicicola* in solution, sand, and soil cultures; to what is the protective action noted in solution and soil cultures due; and why many investigators have obtained divergent results in their work with bacteria at low temperatures. Summarizing the results of his investigations, the author states:

"The increase in the bacteria counts of frozen soils, as determined by the agar-plate method, is due to the breaking up of the clumps of bacteria, not to growth and multiplication.

"There seems to be no change in the bacterial flora of the soil due to freezing. The bacterial activities are influenced only in so far as the physical properties of the soil are affected.

"The concentration of the medium, the length of time of the exposure, and the degree of cold, are the three important factors that determine the power of resistance of the bacteria to low temperature.

"The protective action due to the concentration of the medium seems to be effective only in cases in which the eutectic point of the substances in solution is below the temperature of the exposure. When the bacteria were exposed to the temperature of liquid air the concentration of the medium had less effect.

"The death of the bacterial cell when exposed to low temperature seems to be due to the withdrawal of water from the semipermeable membrane or outer layer of the cell."

Physiological isolation by low temperature in Bryophyllum and other plants, C. M. Child and A. W. Bellamy (*Science, n. ser., 50 (1919), No. 1294, pp. 362–365*).—Studies were made of Bryophyllum and young plants of the scarlet runner bean (*Phaseolus multiflorus*), lima bean (*P. macrocarpus*), and other species, which indicate that the inhibiting action of the growing tip of the plant upon other buds, or of a leaf upon buds on other leaves, can be blocked by a zone of low temperature which does not prevent the flow of water and nutritive substances. The block produced by the zone of low temperature is said to produce no visible or permanent alteration of the tissues, but is wholly reversible. The temperature, which is at first an effective block, may become ineffective after a few days through the adaptation of the cooled zone to that of the temperature. It is believed from the foregoing that the inhibiting action of a growing tip, leaf, or other active region of a plant depends for its passage from point to point upon metabolically active protoplasm, rather than upon purely physical transportation in the fluids flowing through preformed channels in the plant.

Vegetative growth in soils containing crude petroleum, R. H. Carr (*Soil Sci., 8 (1919), No. 1, pp. 67, 68*).—Pot experiments conducted at Purdue University on the influence of crude petroleum oil on the growth of soy beans showed that the growth of soy beans was apparently improved through the addition of small amounts of oil, and that rather large amounts may be mixed with the soil before the soy bean plant is injured. The damage appeared to be due in part to the inability of the plant to secure water rapidly enough to meet its needs. It was found that a small amount of oil appeared desirable in nodule development in the soy bean plant as compared with the check pots, and that where the amount of oil was increased to the extent of damaging the plant there was still some nodule formation.

Trees and shrubs in soda-containing soils of the Hungarian lowlands, J. Bernatsky (*Jahresber. Ver. Angew. Bot., 12 (1914), pp. 44–52, figs. 3*).—An account is given of observations regarding the relations between the presence of soda and the growth of certain plant types.

A new method of studying movement of organisms, F. Moreau (*Bul. Soc. Bot. France, 66 (1919), No. 2, pp. 66–79, figs. 8*).—The most important result of this work is said to be the establishment of the law that the movement of organisms in a medium is on the average proportional to the square root of the corresponding time. The movements are comparable to those of molecules within limits, confirming the theory of gas behavior as regards diffusion in solutions.

Effect of anesthetics upon respiration, A. R. C. Haas (*Bot. Gaz., 67 (1919), No. 5, pp. 377–404, figs. 7*).—A brief review of the various contributions on the subject of anesthetics as related to respiration, also of work done by the author, leads to the conclusion that when Laminaria is exposed to anesthetics in sufficiently high concentration to produce any result the initial effect is an increase in respiration. This may be followed by a decrease, but this only in case the anesthetic is sufficiently toxic.

Respiration after death, A. R. C. Haas (*Bot. Gaz., 67 (1919), No. 4, pp. 347–365, figs. 3*).—It has been found that Laminaria killed by alcohol, acetone, formaldehyde, or ethyl bromid, as well as by drying and by other methods, respires considerably more than in its normal condition.

FIELD CROPS.

[Report of field crops work in Virginia, 1918] (*Virginia Sta. Rpt. 1918, pp. 13, 14, 15, 16, 17, 18–24*).—This describes the progress of work conducted at the station and on the county experiment farms, embracing variety, fertilizer, rotation, and cultural tests with cereals, tobacco, corn, alfalfa, and miscellaneous forage crops.

Observations on factors governing the growth and maturity of corn are held to indicate that no relation exists between the time of germination and the time of maturity of either early or late germinating kernels.

[Report of field crops work in Burma, 1919], W. E. Lowry (*Season and Crop Rpt. Burma, 1919, pp. 3–7, 11–17, 20–31*).—In continuation of similar work, previously noted (E. S. R., 41, p. 528), information is given relative to the acreage, yield, and disposition of rice, wheat, millet, corn, beans, peanuts, sesame, cotton, and miscellaneous crops.

[Report of field crops work in Madras, 1918–19], R. C. Wood (*Rpt. Dept. Agr. Madras, 1918–19, pp. 3–6, 10–13*).—This describes variety, fertilizer, and cultural tests with sugar cane, rice, cotton, and miscellaneous grain and forage crops in continuation of similar work previously noted (E. S. R., 40, p. 625).

[Report of field crops work in Nigeria, 1918], W. H. Johnson (*Ann. Rpt. Agr. Dept. South. Provs., Nigeria, 1918, pp. 5–11*).—This contains brief descriptions of variety, cultural, and fertilizer tests with cotton, corn, peanuts, sugar cane, and yams conducted at various points in southern Nigeria.

How to grow profitable crops on the dry farm, S. T. HORN (*Briggsdale, Colo.: Author, 1919, pp. 60, figs. 4*).—A popular treatise on the subject.

Meadows and forage plants, C. V. GAROLA (*Prairies et Plantes Fourragères. Paris: J. B. Baillière & Sons, 1918, 4. ed., pp. 572, figs. 194*).—In this treatise, one of the series Encyclopédie Agricole published under the direction of G. Wery, the author presents a detailed account of numerous leguminous and nonleguminous meadow plants, together with information relative to the production and utilization of a number of forage plants.

Meadows and pastures: The production of grass, H. DE LAPPARENT (*Prairies et Paturages. La Production de l'Herbe. Paris: Libr. Agr. Maison Rustique, 1918, pp. 172, figs. 48*).—The author describes the establishment and maintenance of meadows and pastures, and presents formulas for seeding mixtures adapted to various types of soil. A table is also given showing the quality of different kinds of seed having a given percentage of purity and germination required to plant a hectare, either alone or in mixtures for both hay and pasture.

The fertilization and management of blue grass pastures, T. B. HUTCHESON and T. K. WOLFE (*Virginia Sta. Rpt. 1918, pp. 39–47*).—This describes briefly the continuation during the period of 1913–1917, inclusive, of work previously noted (E. S. R., 31, p. 37), with particular reference to the comparative value of alternate and continuous grazing and light and heavy grazing, the effect of fertilizers on blue grass pastures, and the eradication of weeds in pastures. The results were substantially the same as in the earlier experiments.

Freezing injury of seed corn, T. A. KIESSELBACH and J. A. RATCLIFF (*Nebraska Sta. Bul. 163 (1918), pp. 3–16, figs. 7*).—Freezing injury of corn, with particular reference to its occurrence in Nebraska, especially during the fall and winter of 1917–18, is discussed. It is said to be due primarily to late maturity or abnormally early freezing weather. Late maturity is ascribed to late planting, the use of unadapted varieties, and weather conditions unfavorable to early ripening. Selecting for earliness by securing seed of some early type, by field selection of seed from early maturing plants or by the selection of the driest and most mature ears later in the season, and testing for germination are recommended as possible means of reducing loss through freezing.

Hogue Yellow Dent corn, selected at seven successive stages of maturity, beginning with the milk stage, and tested for germination late in the winter after being air dried, showed from 80 per cent germination for the milk stage to 97 per cent for both the late roasting ear and denting stages and 96 per cent for mature corn.

An experiment begun in the fall of 1914 to determine the effect of the time of harvesting seed corn upon its yielding power resulted in average yields of 47, 48.3, and 49.8 bu. per acre, respectively, for that harvested by special selection from the field in September, November, and March, while seed saved from the same field during the regular husking period in November yielded at the rate of 49.2 bu.

During the period of 1914–1917, inclusive, large rough, short rough, short smooth, and long slim smooth-ear types of Nebraska White Prize corn were compared with the original unselected strain. They produced average yields of 51.4, 57.1, 56.7, and 58.8 bu. per acre, respectively, with a yield of 58.1 bu. for the original.

Observations made in 1915 and 1916 on the effect of a uniform stand on yield of corn are said to substantiate earlier investigations made at this station by Montgomery (E. S. R., 22, p. 444). The average yield for the three varied distributions was 73 bu. per acre as compared with 74.3 bu. from a uniform planting rate of three plants per hill.

A tabular statement is presented showing the chance distribution of plants when seed corn germinating 75 and 65 per cent, respectively, is planted four kernels per hill in hills 44 in. apart. It is indicated that a satisfactory stand may be obtained from seed of low germination if an adjustment of the planting rate is made.

Corn culture in Brazil, B. H. Hunnicutt (*Bul. Pan Amer. Union, 49* (*1919*), *No. 6, pp. 660–670, figs. 5*).—This comprises a rather general account of the development and present status of corn production in Brazil.

Application of commercial fertilizers to cotton before and after planting, L. E. Rast (*Com. Fert., 19* (*1919*), *No. 5, pp. 54, 56*).—Experiments conducted at the Georgia State College of Agriculture are briefly reviewed, in which it was found that 62.1 per cent of a total average crop was harvested by October 1, when all the fertilizer was applied before planting, but only 59.1 per cent when only half of the fertilizer was applied before planting. Other experiments of a similar nature are reviewed, which have been previously noted.

The extension of cotton cultivation in Egypt, G. C. Dudgeon (*Bul. Imp. Inst.* [*So. Kensington*], *17* (*1919*), *No. 2, pp. 195–204*).—The author discusses the possibilities for the development of the cotton industry in Egypt. It is stated that, excluding the lake area, approximately 5,600,000 feddâns (5,813,000 acres) are already under cultivation, and that about 1,250,000 feddâns of cultivable land remain unirrigated.

The development of cotton growing in Nyasaland (*Bul. Imp. Inst.* [*So. Kensington*], *17* (*1919*), *No. 2, pp. 235–244*).—This comprises a brief account of the history of the cotton industry in Nyasaland and of its present status and future possibilities. It is stated that the type of cotton grown has been generally standardized to Nyasaland upland. It is estimated that 1,309,000 acres possess the climatic and soil conditions deemed suitable for cotton production in this region.

The henequen industry of Yucatan, O. G. Marsh (*Bul. Pan Amer. Union, 49* (*1919*), *No. 6, pp. 640–648, figs. 9*).—This comprises a brief account of the industry.

Molinia cœrulea as a forage plant, F. Honcamp and O. Nolte (*Landw. Vers. Stа., 93* (*1919*), *No. 1–2, pp. 91–95*).—The authors briefly discuss the composition and feeding value of *M. cœrulea* and conclude that in the early stages it makes a fairly good grade of hay.

Yields of varieties of oats [in New South Wales], J. T. Pridham (*Agr. Gaz. N. S. Wales, 30* (*1919*), *No. 2, pp. 777–780*).—This comprises a brief review of tests of different varieties of oats, both for grain and for hay or green fodder, conducted at numerous experimental centers during the period of 1914 to 1918, inclusive. Algerian is said to be the most productive sort for regions of assured rainfall. Ruakura, a New Zealand variety, has given the best results on the coast.

Observations on the industrial and nutritive value of the potato in Ireland, T. Johnson and C. Boyle (*Dept. Agr. and Tech. Instr. Ireland Jour., 19* (*1919*), *No. 4, pp. 416–429, figs. 3*).—Supplementing work previously noted (E. S. R., 41, p. 829), the authors report the results of analyses of 87 samples of Up-to-Date potatoes grown under uniform conditions, 40 samples of Up-to-Date grown under different conditions, and sample of 89 different varieties grown under uniform conditions.

The starch content of tubers of the same variety grown under similar conditions was found to vary from 14.65 to 20.75 per cent, and the dry matter from 21.07 to 27.18 per cent. Tubers of the same variety grown under different conditions exhibited a range in starch content of from 10 to 18.2 per cent and of dry matter from 17 to 26.6 per cent. Of the 89 varieties grown under similar conditions the starch content varied from 10 per cent for Ashleaf to 20.9 per cent for Langworthy, while the dry mattter varied from 17.4 per cent for Sutton A 1 to 27.5 per cent for both Culdee Castle and Golden Wonder.

Sudan grass [in New South Wales], E. BREAKWELL and G. G. ST. CLAIR POTTS (*Dept. Agr. N. S. Wales, Farmers' Bul. 128* (*1919*), *pp. 17, figs. 5*).—The adaptation of the crop to conditions in New South Wales is discussed, and cultural methods and field practices employed in growing it under irrigation are described.

Tobacco [in Porto Rico], J. F. LEGRAND (*Rev. Agr. Puerto Rico, 3* (*1919*), *No. 6, pp. 1–14, figs. 9*).—This comprises a rather popular account of the production and utilization of tobacco in Porto Rico.

The development of the tobacco growing industry in Great Britain, A. WOOD (*Westminster, London: Brit. Tobacco Growers' Soc., Ltd.* [*1919*], *pp. 23*).—This comprises a progress report of the British Tobacco Growers' Society, founded in 1913, setting forth the development of the industry for the past six years.

Technical notes on the cultivation and treatment of tobacco in Great Britain, A. V. CAMPBELL (*Westminster, London: Brit. Tobacco Growers' Soc., Ltd.* [*1919*], *pp. 27*).—This is a discussion of the subject, based on information secured in connection with the work of the organization mentioned above.

The future of wheat production with special reference to the [British] Empire, A. S. JUDGE (*Bul. Imp. Inst.* [*So. Kensington*], *17* (*1919*), *No. 2, pp. 205–235*).—This comprises a rather comprehensive discussion of the subject, embracing observations on the world's production and consumption of cereals, including wheat, rye, barley, oats, corn, and rice; the source of European supplies of cereals; varieties and qualities of wheat; and wheat production, distribution, and trade in the principal countries of the world.

Yields of the lesser yam and of some African yams, I. H. BURKILL (*Gardens' Bul. Straits Settlements, 2* (*1919*), *No. 5, pp. 159–165, pl. 1, fig. 1*).—The author briefly describes both wild and cultivated races of the lesser yam (*Dioscorea esculenta*) grown in the Singapore Botanic Gardens, and presents yield data for the different sorts when grown under varying conditions. Information is also given relative to the yields of African yams grown in the Gardens for the period of 1915–1919. See also a previous note (E. S. R., 41, p. 832.)

The testing of seeds order, 1918 (*Jour. Bd. Agr.* [*London*], *26* (*1919*), *No. 8, pp. 811–820*).—This comprises a discussion of the administration of the seed testing regulations in Great Britain.

Eradication of field hawkweed, T. B. HUTCHESON and T. K. WOLFE (*Virginia Sta. Rpt. 1918, pp. 31–38, figs. 5*).—This describes experiments made in cooperation with the U. S. Department of Agriculture during 1917 and 1918 in the control and eradication of the field hawkweed (*Hieracium pratense*), said to be a serious pest of blue grass pastures in Virginia.

The results are held to indicate that proper applications of either sodium arsenite, nitrate of soda, salt solution, or dry salt were effective in controlling hawkweed without permanent injury to Kentucky blue grass, while the use of fuel oil and dip oil and the removal of weeds with the hoe were not satisfactory. Dry salt was found to be the most effective material used, but the grass did not recover until the following spring, while repeated applications of sodium arsenite solution were nearly as efficient and the grass recovered much more quickly. Repeated applications of nitrate of soda solution proved to be inferior to the repeated use of sodium arsenite, but the former gave good results and the grass recovered rapidly. Five to six applications of either sodium arsenite, nitrate of soda, or salt solution are deemed necessary at intervals throughout the season to hold the weed in check, while a single application of dry salt in the late fall has given good results.

The distribution and control of field weeds in Germany.—I, Biologic studies and general control, O. Wehsarg (*Arb. Deut. Landw. Gesell., No. 294 (1918), pp. 21-496, figs. 44, pls. 5*).—Supplementing work previously noted (E. S. R., 29, p. 337), the author presents a detailed study of certain biological aspects of the weed problem, together with a review of the success attained with various control measures. The discussion is based largely on information secured from questionnaires representing a wide range of soil and cultural conditions.

The first part of the article deals with biological studies, including observations on germination and the effect of external factors upon germination and vigor of weed seeds, the periodicity of maturity, the germination of weed seeds in the field, the length of life of buried weed seeds, weeds in cultivated soil and their destruction, the growth of the plant, the distribution and preservation of weed seeds, the source of field weeds in Germany, ecological factors favoring the appearance of certain weeds, and the harmful effects of weeds. The second part, relating to control measures, comprises a discussion of those measures to be employed by the individual farmer, as well as those of more general application. A tabulated statement is presented showing the legal provisions for weed control for each State, and for the different weeds.

HORTICULTURE.

Cooperative and other organized methods of marketing California horticultural products, J. W. Lloyd (*Univ. Ill. Studies Soc. Sci., 8 (1919), No. 1, pp. 142*).—A contribution from the University of Illinois. The subject matter is based upon studies made by the author during a residence of nearly two years in California. The successive chapters discuss the advantages of cooperative marketing; fundamental principles of cooperative marketing; basis of membership; financing the organization, distribution of benefits, and basis of voting; essential details of cooperation; various California marketing organizations; relation of growers' cooperative marketing organizations to control of production, distribution, and prices; reducing the cost to the consumer; and the applicability of California cooperative marketing methods to other producing regions. A bibliography is appended.

The California fruits and how to grow them, E. J. Wickson (*San Francisco: Pacific Rural Press, 1919, 8. ed., rev., pp. 493, pls. 15, figs. 67*).—The present edition of the author's work (E. S. R., 31, p. 836) has been fully revised and reset.

Frost control and related factors, J. C. Whitten (*Mo. Bul. Dept. Agr. Cal., 8 (1919), No. 11-12, pp. 675-678*).—A contribution from the University of California, in which the author deals particularly with the effects of such factors as irrigation, tillage, pruning, and spraying on the hardiness and resistance of fruit trees.

How to prune and why, W. H. Chandler (*Cornell Countryman, 17 (1920), No. 5, pp. 272, 273, 292, fig. 1*).—The results of some experiments on apple and peach trees that are being conducted at the New York Cornell Experiment Station are briefly summarized.

A careful record was kept of leaf surface and of top and root growth on pruned and unpruned trees. In all cases pruning has reduced the leaf surface and also the root growth. In the case of young trees it has also reduced the size of the top by more than the amount of pruning.

On some 4-year-old peach trees that were cut back rather severely in the spring and again in the following spring, pruning temporarily increased the top growth, although the root growth and leaf surface were greatly reduced. It is pointed out that this increased top growth occurs early in the summer and at the expense of materials formed in the leaves which would otherwise have moved downward to promote root growth. The reduced root growth would eventually reduce the vigor of the top growth, hence if pruning is to be used as an invigorating process for peach trees it must be practiced each year, and the increased vigor must always come at the expense of a reduced top.

In some training experiments with young apple trees the training has been concentrated on three forms—a natural form, where very little pruning is done; the central leader form, where by pruning back the branches the growth is directed into the upright trunk; and an open head form, where about five branches are permitted to grow, each being trained with a main leader, the upper branch being the largest. To secure this last form has required more pruning than for either of the others, the trees have been dwarfed in size, and the yield rather markedly reduced. Thus far no evidence has been secured as to the ultimate value of the different forms during the later life of the trees.

Report on cranberry investigations for the season of 1918, C. S. Beckwith (*Proc. Ann. Meeting Amer. Cranberry Growers' Assoc., 49 (1919), pp. 3-14, figs. 6*).—The author outlines different problems under way, and gives a progress report on fertilizer investigations that have been conducted by the New Jersey Experiment Stations on different types of bottom land since 1913 (E. S. R., 39, p. 743). As noted in the previous account, applications of single elements and of mixed fertilizers were started in 1913 and discontinued in 1915, since which time observations have been continued to determine the residual effect of the various fertilizer treatments. In the present report the results secured during the three years of fertilization and the three subsequent years are presented as a whole.

With reference to the use of single elements, the experiment shows that nitrogen and phosphoric acid gave excellent results in increased yields on savannah bottom. Potash gave similar results but to a lesser degree on this type of bottom. None of these plant foods gave results worthy of consideration on mud bottoms, while on iron ore bottoms nothing but phosphoric acid derived from phosphoric rock gave results worthy of consideration. The failure of the plant foods to give results on mud bottoms seems to be chargeable to the fact that soil moisture and not plant food is the limiting factor. When fertilizers are to be used on savannah bottoms to secure quick results the nitrogen should be derived from nitrate of soda, but for long-continued results it should be secured from dried blood or cottonseed meal. The phosphoric acid should be secured preferably from acid phosphate or from phosphate rock, which gave nearly as good results as the acid phosphate. The potash should be secured from sulphate of potash, although the returns from potash were small as compared with those from nitrogen and phosphoric acid.

The data on the use of mixed fertilizers indicate as a whole that in all probability the application of a mixed fertilizer on cranberries grown on savannah bottoms where drainage is sufficient will result in material increases in yield. The results secured with mixed fertilizers on mud bottoms and on iron ore bottoms were inconclusive.

The only insect enemy given attention during the year was the girdle worm. A test was made to determine the smallest amount of sodium cyanid necessary to destroy the worm and also the smallest amount of water necessary to use with the cyanid for effective work. The data secured indicate that 0.75 oz. of sodium cyanid dissolved in 19 gal. of water and spread over 25 sq. ft. would kill the girdle worms that have not yet formed their cocoons. The work was conducted too late in the season to determine the effect of the cyanid upon the cranberry plant.

Loganberry culture, K. W. Munson and E. W. White (*Brit. Columbia Dept. Agr., Hort. Branch Circ. 54 (1920), pp. 23, figs. 10*).—A practical treatise on the culture, harvesting, and marketing of the Logan blackberry.

Cooperative marketing in the Chautauqua-Erie grape industry, H. D. Phillips (*New York Cornell Sta. Mem. 28 (1919), pp. 7–94, pls. 5, figs. 6*).—Data gathered from the files of local papers published in the Chautauqua-Erie grape belt, records and books of associations and independent shippers, and personal interviews and correspondence are here presented showing general aspects of the grape industry and details of the history of the various associations that have been formed. This study brings out two types of association, local and belt wide, in regard to which it is concluded that in spite of the incomplete success of the belt-wide associations, they have still been able to accomplish more permanent good for the grape industry as a whole than has the local type of organization.

The author considers difficulties peculiar to the region and to the crops marketed, difficulties of organization, legal difficulties encountered, and gains from cooperative effort. His conclusions are that many difficulties can be mitigated by proper planning of operations with efficient, salaried management, incorporated on a truly cooperative basis, and enforcing the penalty clause now having legal sanction in New York State. Other difficulties involved in handling the fruit, especially the maintaining of proper standards of packing and pooling of returns received, would be solvable under a belt-wide association which would provide for a union of semi-independent local associations, the nearest approach to which was a shippers' agreement of 1895, loosely drawn and faulty in important details. The handicap of a short shipping season may be lessened by diversified farming and by encouraging associations to handle other products and sell farm supplies.

Problems still remaining are the peculiar character of the grape as a fruit, the nearness of the region to markets, and the relations with the local grape-juice factories.

The text of New York State laws relating to cooperative organizations and of amendments to the State and Federal antitrust laws which affect cooperative organizations in New York is appended.

First report of fruit culture as practiced round about Tharushah (Sind) in Nawabshah District, Mahomed Umarkhan F. Barakzai (*Dept. Agr. Bombay Bul. 88 (1918), pp. 18*).—Methods of growing such fruits as the mango, orange, and jujuba are described, and a tabular statement is given showing the probable income that would be obtained by a fruit grower after 12 years on a 4-acre fruit garden.

The avocado in Trinidad and Tobago, W. G. Freeman (*Bul. Dept. Agr. Trinidad and Tobago, 18 (1919), No. 3, pp. 113–124, figs. 5*).—Notes on the early history and cultivation of the avocado in the West Indies, including cultural suggestions. Tabular data are given showing the variation in weight of fruit and proportion of stone in some Trinidad avocados, together with data from

Bulletin 25 of the Hawaii Federal Experiment Station (E. S. R., 28, p. 441) showing the percentage composition of the edible portion of the avocado.

Budding the avocado, R. O. WILLIAMS (*Bul. Dept. Agr. Trinidad and Tobago, 18 (1919), No. 3, pp. 125–128*).—In budding experiments conducted at the St. Clair Experiment Station in 1915 the percentage of successes when stocks 6 weeks to 4 months were used ranged between 58 and 94, with an average of 74. When stocks 10 to 12 months old were used the percentage of stocks fell to 17.1. Numerous other trials with old and young stocks recently conducted confirm these figures. Notes are given on the advantages and method of budding.

Studies of Philippine bananas, E. QUISUMBING Y ARGÜELLES (*Philippine Agr. Rev., 12 (1919), No. 3, pp. 9–90, pls. 30*).—A contribution from the Philippine College of Agriculture, comprising a systematic study of the Philippine variety of bananas that was first undertaken by N. G. Teodoro and continued later by the author. In addition to a general synopsis of the banana groups, a key is given to the species of Musa in the Philippines, together with a synopsis and descriptions of the Philippine varieties of *Musa sapientum.*

Cacao cultivation, A. J. BROOKS (*[Imp. Dept. Agr. West Indies], Agr. Dept. St. Lucia, Leaflet 15 (1918), pp. 17*).—This comprises suggestions on various cultural practices needed for the general improvement of cacao plantations in St. Lucia.

Response of citrus seedlings in water cultures to salts and organic extracts, J. F. BREAZEALE (*Jour. Agr. Research* [*U. S.*], *18 (1919), No. 5, pp. 267–274, pls. 2*).—A contribution from the Bureau of Plant Industry of the U. S. Department of Agriculture, in which are presented the results of experiments conducted mainly at Riverside, Cal., in connection with other investigations relating to the causes of the malnutrition of citrus trees. Seedlings principally of lemon and grapefruit, but also including several varieties of oranges, were grown in water cultures and treated with various salts and organic matter in solution.

Seedlings of the various citrus stocks experimented with show no characteristic difference in response in water cultures or in resistance to toxic solutions.

"Very dilute organic extracts from upland peat (10 parts per million or more) produced a marked stimulation of the root growth of citrus seedlings. Corresponding concentrations of sodium nitrate or potassium chlorid did not stimulate the root development. Calcium carbonate stimulated the root growth and exerted a pronounced antagonistic action to toxic solutions of nitrates and ammonium sulphate. Peat extract in very dilute concentrations (20 parts per million) and calcium carbonate (solid phase present) both protected citrus seedlings to a marked degree against the toxins of distilled water.

"The tolerance of citrus seedlings for alkaline salts is relatively high. The toxic limit for calcium hydrate was 100 to 120 parts per million, for sodium hydrate 250 to 300 parts per million, and for sodium carbonate 550 to 600 parts per million. The hydroxyl concentration in the toxic calcium hydrate solution is only about one-third that of the toxic sodium hydrate solution. When soluble organic matter which is acid in reaction and stimulating to citrus seedlings in concentrations up to 1,000 parts per million or more is added to a sodium carbonate solution of 400 parts per million which in itself is not toxic, a highly toxic solution is formed which will kill the root tips of citrus seedlings. This reaction appears to be of importance in connection with the toxicity of soils containing small amounts of sodium carbonate."

The application of the principles of breeding to drug plants, particularly Datura, C. M. WOODWORTH (*Bul. Univ. Wis. No. 1005 (1919), pp. 32, figs.*

14).—A contribution from the University of Wisconsin, in which the author discusses the principles of plant breeding, with special reference to the improvement of drug plants. Special attention is given to Datura in view of the breeding investigations conducted with this plant at the university and by earlier investigators. Experimental results with Datura are noted and consideration is given to the various phases of breeding, such as methods of hybridizing, selection, mass selection, pure line selection, and mutations. An outline of the necessary steps involved in a long-continued breeding investigation for the improvement in alkaloidal content of Datura is included.

The spice gardens of Sirsi in Kanara, D. L. Sahasrabuddhe (*Dept. Agr. Bombay Bul. 83* (*1917*), *pp. 51, pls. 8*).—In 1914 several representatives of the Poona Agricultural College made a survey of the spice industry in the neighborhood of the town of Sirsi in the North Kanara district of the Bombay Presidency. This bulletin comprises a preliminary report of the survey. It includes a detailed account of methods of cultivating such plants as cardamoms, pepper, betel palm, betel vine, etc., together with results and observations made during the survey and provisional conclusions relative to the industry.

Garden first in land development, W. Webb (*New York and London: Longmans, Green & Co., 1919, pp. XIII+124, pls. 25*).—A contribution to the subject of suburban land development, in which special attention is given to the planning and planting of the tract as a whole before any buildings are erected, thus making the individual holding but a unit of a community garden. Emphasis is placed on the development of rural effects. The subject matter is based upon the author's experience of nearly 30 years in developing a tract of 260 acres, "Garden First," in the vicinity of London. Following the introductory chapter, the succeeding chapters deal with hedges and trees, gardens, roads, roadside decoration, houses, finance and law, and the village.

The small garden: A practical manual of horticulture, D. Bois (*Le Petit Jardin Manuel Pratique d'Horticulture. Paris: J. B. Baillière & Sons, 1919, 4. ed., rev. and enl., pp. 476, figs. 225*).—The greater part of this work comprises a manual of ornamentals, fruits, and vegetables, with specific cultural directions. The first few chapters discuss the general principles of fruit, vegetable, and flower gardening. The concluding chapters contain a monthly working calendar, directions for the control of insect pests and diseases, and definitions of techncal words most frequently used in gardening.

Roses for home and garden, G. M. Taylor (*London: "Garden Life" Press,* [*1919*], *pp. 93, figs. 2*).—A popular treatise on rose growing, including lists of varieties suitable for various purposes.

FORESTRY.

One aspect of the national program of forestry: Cost, R. S. Hosmer (*Jour. Forestry, 18* (*1920*), *No. 1, pp. 9–12*).—A brief discussion of methods of financing a national program of forestry and the distribution of costs as between the public and forest-owning interests.

Legislative machinery for enforcement of private forestry measures, C. R. Pettis (*Jour. Forestry, 18* (*1920*), *No. 1, pp. 6–8*).—The author presents certain suggestions relative to the lumbering of hardwood forests in New York State, with special reference to the maintenance of future production, and recommends the employment of competent foresters to work through the State in a similar manner to the farm bureau agents.

Inspection, supervision, and control of private forestry measures: Methods and cost, A. B. Recknagel (*Jour. Forestry, 18* (*1920*), *No. 1, pp. 23–*

25).—In this paper the author briefly discusses ownership conditions in the State of New York, with special reference to the Adirondacks and Catskills, and then considers what organization the State would need if each private owner of 500 or more acres of timberland were to operate under a working plan for continuous forest production.

The approximate cost of private forestry measures in the Adirondacks, H. L. Churchill (*Jour. Forestry, 18* (*1920*), *No. 1, pp. 26–30*).—An analyses of cost data secured in working a tract of about 150,000 acres in the east central Adirondacks is given.

A decade of private forest planting in Pennsylvania, J. S. Illick (*Amer. Forestry, 25* (*1919*), *No. 312, pp. 1538–1541, figs. 6*).—An account of private tree planting activities in Pennsylvania since 1910.

During the period 1910–1919, the State distributed 8,946,876 trees to private planters. The planting of forest trees by private owners of woodland has become an established practice, and is being extended annually.

Fundamental silvicultural measures necessary to insure forest lands remaining reasonably productive after logging, H. P. Baker and E. F. McCarthy (*Jour. Forestry, 18* (*1920*), *No. 1, pp. 13–22*).—In this paper the authors call attention to a number of important problems which should be considered before formulating silvicultural plans for the permanent treatment of forest lands.

How shall we make our forests safe for trees? C. D. Howe (*Comm. Conserv. Canada Rpt., 10* (*1919*), *pp. 176–184, pl. 1*).—An examination of existing conditions in Canada led the author to conclude that fire-protective measures now in force are entirely inadequate to preserve the present supply of the important commercial timber trees, and that the prevailing lumbering methods on unburned areas tend to establish conditions in which the best species can not regenerate themselves in their former numbers. A plea is made for the development by the Government of methods of fire protection, lumbering, and forest planting on cut-over lands that shall keep the great areas of forest soils continuously productive in terms of saw-logs or pulpwood.

The disposal of infected slash on timber-sale areas in the Northwest, E. E. Hubert (*Jour. Forestry, 18* (*1920*), *No. 1, pp. 34–56*).—In this paper the author discusses the factors concerned in production of sporophores of wood-destroying fungi, presents field data indicating that large numbers of sporophores of various fungi are found developing upon infected slash left upon cut-over areas, and suggests methods for the disposal of infected slash. A bibliography of cited literature is included.

The use of seaplanes in forest mapping, E. Wilson (*Jour. Forestry, 18* (*1920*), *No. 1, pp. 1–5*).—Experiments were conducted by the author during 1919 in making photographic maps from a seaplane of forests in the St. Maurice Valley of Quebec. A brief account is given of the equipment used and the results secured.

[Report of] committee on forests, C. Leavitt (*Comm. Conserv. Canada Rpt., 10* (*1919*), *pp. 140–163*).—Brief reviews of forest activities in the various Provinces of Canada during 1918, with reference to fire protection, forest extension, forest surveys, new legislation, organization, etc., including the recommendations of the committee of forests to the Commission of Conservation.

Quebec forest regeneration survey, C. D. Howe (*Comm. Conserv. Canada Rpt., 10* (*1919*), *pp. 164–175, pls. 2*).—During the summers of 1917–18 a regeneration survey was made under the direction of the Commission of Conservation to determine the future yields of balsam and spruce on cut-over lands. Data are given for several sample areas showing the present number of trees per acre of different diameter classes following light, moderate, and heavy logging.

The growth studies thus far made indicate that, although there are about as many spruce trees remaining as have been removed by logging operations, the trees of the smaller diameter classes grow so slowly that they can not be depended upon to reach commercial size during a period within which the lumberman can afford to hold his limits. In view of the great susceptibility of balsam to insect and fungus attack, no prediction was made as to the future yield of this tree. It is pointed out, however, that if methods of checking the disease mortality of this species could be solved there would be no occasion to worry over the future pulpwood supply in Quebec.

[Report of the] mission for the study of forest conditions sent to the French Colonies by the ministries of war, armament, and the colonies.—III, The colonial forest question, A. Bertin (*Mission d'Etudes Forestières Envoyée dans les Colonies Françaises par les Ministères de la Guerre, de l'Armement, et des Colonies.—III, La Question Forestière Coloniale. Paris: Govt., 1919, vol. 3, pp. XX+833, pls. 51, figs. 77*).—The present volume of the mission's report (E. S. R., 41, p. 743) comprises six books or parts.

Part 1 is an exposition on the commercial importance of the colonial forests as a source of timber supply, primarily for France but also for the world's markets. Part 2 contains descriptions of general conditions in the Ivory Coast, Gabon, and Kamerun and of the tropical forests of Africa, together with data based on measurements of numerous sample areas, showing the relative distribution, abundance, and size of the various species. This part concludes with a classification and concise descriptions of the botanical families represented in the tropical forests of Africa. Part 3 describes in detail, methods of exploiting timber in the colonies. Notes are also given on methods employed in France, Canada, Switzerland, and the United States, with reference to their possible use in the colonies. Part 4 deals with systems of management and silviculture adapted to tropical countries, concession regulations, etc. Part 5 contains the results of studies relative to the mechanical properties and industrial use of several colonial woods. Part 6 contains the conclusions of the mission relative to the various phases of the investigation.

Progress report of the Forest Research Institute for the year 1918–19, W. F. Perrée (*Rpt. Forest Research Inst.* [*Dehra Dun*], *1918–19, pp. 22*).—Brief statements of progress made in various problems relating to silviculture, forest botany, utilization of wood, forest zoology, and forest chemistry, including a financial statement for the year. A list of forest publications issued since the establishment of the Forest Research Institute, as well as statements of revenues, expenditures, etc., are appended.

Timbers and their uses, W. Winn (*London: George Rutledge & Sons, Ltd., 1919, pp. 333, pls. 24*).—A handbook for woodworkers, merchants, and others interested in the conversion and use of timber. A bibliography of related literature is appended. The successive chapters discuss the uses of wood, geographical distribution, insect pests of timber, fungus pests of timber, accidents during growth, the world's timber resources, manufacturers, etc., the structure and formation of wood, seasoning of wood, and timber testing.

Growing black walnut on Ohio farms, E. Secrest (*Mo. Bul. Ohio. Sta., 4 (1919), No. 10, pp. 318–322, fig. 1*).—The author calls attention to the economic importance and present supply of black walnut, and its adaptability to Ohio conditions. Methods of propagation and culture peculiar to the species are then given.

The growth of Hevea brasiliensis in the Philippine Islands, H. S. Yates (*Philippine Jour. Sci., 14 (1919), No. 5, pp. 501–525, fig. 1*).—A contribution from the Philippine Bureau of Science.

Rainfall, temperature, and soil data obtained in the southern part of the Philippine Archipelago as compared with similar data from countries where Hevea rubber is successfully cultivated indicates the suitability of the former region for Hevea. Growth measurements and yield data of trees now growing in the Philippines compare favorably with similar records obtained in Ceylon and Malaya.

Aeroplane lumber production in British Columbia, R. D. CRAIG (*Comm. Conserv. Canada Rpt., 10 (1919), pp. 185–191*).—A summarized account of activities dealing with the production of airplane lumber during the war.

DISEASES OF PLANTS.

Plant diseases in crop production, C. R. ORTON (*Penn. State Farmer, 11 (1918), No. 2, pp. 273, 282*).—A brief account is given, estimating losses for 1917 in Pennsylvania owing to plant diseases supposedly preventable by means which are discussed.

Seed as a carrier of plant diseases, G. GENTNER (*Jahresber. Ver. Angew. Bot., 12 (1914), pp. 28–43*).—This article deals with a number of economic plants in relation to infecting organisms.

Report of the division of botany, H. W. BARRE (*South Carolina Sta. Rpt. 1919, pp. 29–34*).—A summary is given of the work carried on by the division of botany during the year covered by the report. A number of lines of work were temporarily abandoned, but investigation on the cotton anthracnose was continued on a somewhat lessened scale. Studies of the influence of different factors on the vitality of the anthracnose fungus were continued, and it was found that the moisture content of the seed was an important factor in the vitality of the fungus. Infected seed in which the moisture content was reduced from 9 to about 2 per cent showed that all of the fungus was killed, while these seed germinated just as well and in some cases better than untreated seed. It was found that the fungus was killed more readily by heating and drying than by desiccation alone, and experiments are in progress with a drier for the treatment of seed in quantity.

In connection with this investigation, Miss Ellen Converse isolated several strains of anthracnose from materials sent from different States, and it is expected that these strains will be studied further. During the summer of 1918, she found species of Colletotrichum growing in the nectar glands of cotton leaves, and wherever the anthracnose was present in the field the fungus was found in glands of some of the leaves. Inoculations made with a strain of the Colletotrichum proved that it was capable of producing anthracnose, and led to the conclusion that the nectar gland of the leaf is a place where the anthracnose fungus is able to live over during the summer, and may be an important source of inoculation for the bolls after they begin to develop.

Notes are also given on investigations of bacterial content of milk and the results of the plant disease survey made in the State.

[Report on] plant pathology and bacteriology departments (*Virginia Sta. Rpt. 1918, pp. 27–29*).—A summary is given of the work in progress during the year covered by this report. One of the principal projects investigated was the root rot of apple trees due to *Xylaria* spp., some of the more important technical features of which has been noted (E. S. R., 37, p. 754). None of the strains of the fungus have produced ascospores, hence their specific identification is difficult. Field studies on methods of dissemination and on the development of the disease with reference to the type of soil and condition prior to planting are being continued. Several instances are reported where the disease was more destructive on newly cleared land than on old land.

Brief notes are given on other investigations, which include the study of the relation between parasitic fungi and their hosts, nitrogen compounds of soils as affected by bacterial activities, relative susceptibility of tomato varieties to disease, experiments for the control of diseases of plants, and the plant disease survey.

An account is given of a leaf spot disease of tobacco, which has been previously noted (E. S. R., 40, p. 848) and which is said to be prevalent in the flue-cured belt. A bacterium has been isolated from diseased tobacco leaves, and its pathogenicity has been proved by inoculation experiments. In connection with the plant disease survey, attention is called to a disease of wheat due to the nematode *Tylenchus tritici*. A preliminary account of this disease has already been noted (E. S. R., 42, p. 47).

North American rusts on Cyperus and Eleocharis, F. D. Kern (*Mycologia, 11 (1919), No. 3, pp. 134–147*).—The author, excluding a few names now current, lists nine species, describing of these as new, *Puccinia abrepta* on *C. ferax; P. liberta* on *Eleocharis cellulosa, E. flaccida, E. geniculatus, E. montana, E. mutata,* and *Eleocharis* sp.; and *Uredo incomposita* on *E. geniculatus, E. interstincta,* and *Eleocharis* sp. The author describes as a new combination *P. cyperi-tagetiformis.*

Notes on some polemoniaceous rusts, C. R. Orton (*Mycologia, 11 (1919), No. 4, pp. 168–180*).—This is the result of a study by the author on polemoniaceous rusts, attempting to clear up some of the existing uncertainties regarding their relationships and classification.

Cereal rust of small grains, I. E. Melhus and L. W. Durrell (*Iowa Sta. Circ. 62 (1919), pp. 3–16, figs. 11*).—Popular descriptions are given of the stem and leaf rusts of cereals, particular attention being given to the black stem rust (*Puccinia graminis*) of wheat and the crown rust (*P. coronata*) of oats. The relation of these two species to their alternate hosts is described, and for the control of the stem rusts the authors recommend the growing of varieties that mature before the rust becomes markedly prevalent and destructive, the development of resistant varieties of grain, and the destruction of the alternate host, the common barberry. Notes are also given of the leaf rust of wheat (*P. triticina*), leaf rust of rye (*P. dispersa*), and the dwarf leaf rust of barley (*P. simplex*).

The stage of maturity of cutting wheat when affected with black stem rust, J. H. Ellis (*Agr. Gaz. Canada, 6 (1919), No. 11, p. 971*).—Experiments are noted indicating that grain should not be cut at a stage before it would be harvested in the ordinary course of events if rust were absent, the maximum weight being secured by cutting when the grain can no longer be crushed when pressed between thumb and finger. The general observations made are briefly detailed.

Corn smut in Ohio, W. Van Pelt (*Mo. Bul. Ohio Sta., 4 (1919), No. 10, pp. 323, 324, fig. 1*).—A popular description is given of the corn smut fungus (*Ustilago zeæ*).

The author reports the complete absence of corn smut where the soil was not cropped for 8 or 10 years, but a heavy infection from the same seed on other fields which had been continuously cropped. A recommendation is given for the removal of the smut before the balls ripen, and the author suggests that the entire smutted stalk should be cut off next the ground and destroyed by burning. If the stalk is cut off above the ground, the open place upon the stub is said to be almost certain to produce other smut balls.

Cotton root rot spots, C. S. SCOFIELD (*Jour. Agr. Research* [*U. S.*], *18* (*1919*), *No. 6, pp. 305–310, figs. 7*).—In a contribution from the Bureau of Plant Industry of the U. S. Department of Agriculture, the author gives observations of field investigations on the occurrence of cotton root rot spots due to *Ozonium omnivorum.* While it is frequently believed that the root rot spots carry over from year to year, the author, from the evidence presented, does not believe this to be a fact. It is shown that while the disease does usually occur in well-defined spots in one season, it may not occur there another season but may appear in a new place.

Physiological study of the parasitism of Pythium debaryanum on the potato tuber, L. A. HAWKINS and R. B. HARVEY (*Jour. Agr. Research* [*U. S.*], *18* (*1919*), *No. 5, pp. 275–298, pls. 3, figs. 2*).—The authors, in the Bureau of Plant Industry of the U. S. Department of Agriculture, made an investigation of the parasitism of *P. debaryanum* of the potato plant.

While it was not shown that the fungus penetrates the cell walls of the potato by mechanical pressure, there is considerable evidence that the main factor in this penetration is the growth pressure of the fungus filament, and that the resistance of the White McCormick potatoes to this disease is due to cell walls that are more resistant to mechanical puncture than are the cell walls of extremely susceptible varieties. *P. debaryanum* was found to destroy the pentosans, starch, and sugar of the potato tuber, causing it to rot. The fungus secretes a toxin which kills the cells of the potato and also an enzym which breaks down the middle lamellæ of the cells. The osmotic pressure within the fungus filament as determined by plasmolysis was found sufficient to develop the pressure necessary to penetrate the cell walls in potato tubers in nearly every case observed. Where infection occurred, studies were made of the tissues of a number of varieties of potatoes, and it was found that more pressure was required to penetrate the tissues of the White McCormick, which is comparatively resistant to the fungus, than to penetrate the tissues of Bliss Triumph and Green Mountain, two very susceptible varieties.

Keeping seed potatoes from disease attacks, R. C. THOMAS (*Mo. Bul. Ohio Sta., 4* (*1919*), *No. 11, pp. 341–344, figs. 4*).—The author discusses the advantage of selection of tubers, the importance of care of potatoes in the storage house, and the effects of sprouting on subsequent development.

The mosaic disease of sugar cane and other grasses, E. W. BRANDES (*U. S. Dept. Agr. Bul. 829* (*1919*), *pp. 26, figs. 5, pl. 1*).—This disease, which the author considers the same as that known in Java as yellow-stripe disease of sugar cane (E. S. R., 10, p. 57), is reported to have appeared in Porto Rico in 1916 (E. S. R., 39, p. 53), and since that time, according to the author, it has spread until three-fourths of the cane fields of the Island are invaded. The disease is known to occur also in San Domingo, Cuba, St. Croix, Hawaii, and Argentina. As a result of recent survey, its presence was revealed in Florida, Georgia, Alabama, Mississippi, and Louisiana, where it is said to be causing considerable loss of some varieties of cane.

The early symptoms of the disease are indicated by the appearance of irregular light-colored streaks or spots on the leaves. Two distinct types of color are observed, one which is merely a dilution of the normal color, while in the second type yellow is predominant and the affected areas have a decided yellowish-green appearance. The normal and affected areas are sharply demarked.

The effects of the disease appear to be cumulative, and on the first ratoons which became affected the previous year, or in plant cane originating from diseased cuttings, considerable stunting injury is produced. At this time small white opaque spots and streaks appear in the light-colored areas, and they may become confluent to some extent. The total leaf area affected in this way may amount to 20 to 30 per cent of the whole.

About this time the next year a canker of the stalks may be observed, and this seems to be one of the most serious forms of infection. When a large proportion of the plants in a field is infested, the aspect is said to resemble severe drought. The foliage of the entire field is yellowish, and the plants are more or less noticeably stunted. Attention is called to injuries resembling mosaic, and the degree of susceptibility of different varieties toward this disease is pointed out.

In addition to sugar cane, a number of grasses are subject to the mosaic disease, among them corn, sorghum, rice, millet, crab-grass, foxtail, and Panicum. The sugar-cane mosaic is said to be an infectious chlorosis, similar in many respects to mosaic disease of tobacco, cucumber, bean, tomato, and potato. The infectious nature of the disease has been demonstrated and some evidence has been secured that indicates that it is transmitted by carriers. For the control of the mosaic of sugar cane the author recommends the elimination of diseased plants by roguing, by grinding all cane, and securing clean seed, exclusion, and eradication, and elimination by planting immune varieties.

Pests of apple trees.—American blight and canker, F. O. Mosley (*Univ. Col. Reading, Dept. Agr. and Hort. Bul. 29, pp. 8, figs. 18*).—This bulletin deals very briefly with American blight (*Schizoneura lanigera*) and canker (*Nectria ditissima*) of apple, both of these being of widespread occurrence and responsible for much loss, chiefly in old and neglected orchards, but also in less degree in many comparatively young trees. Both are discussed as to injury done and control by means of different applications.

Apple blotch control proves successful (*Mo. Bul. Ohio Sta., 4 (1919), No. 11, p. 344*).—It is claimed that five applications of Bordeaux mixture, beginning two weeks after the fall of the petals and repeated at two weeks' intervals, secured a 90 per cent control of apple blotch. The variety Smith Cider, which is considered one of the least resistant varieties against blotch, was effectively protected, sprayed trees yielding 13 bu. of fruit while unsprayed trees produced only 2 bu.

A disease of pears new to the continent of America (*Agr. Gaz. Canada, 6 (1919), No. 11, pp. 951, 952, fig. 1*).—A disease reported as found on apples near Ithaca, N. Y., in 1915 (E. S. R., 35, p. 848), is said to have been demonstrated on pears received in September, 1919, from Kentville, Nova Scotia. The attack, which is attributed to *Phytophthora cactorum*, appears to be confined to low-hanging branches, suggesting that it may spread from the surrounding vegetation.

Peronospora [and] Oïdium (*Landw. Jahrb. Bayern, 9 (1919), No. 1, pp. 42–44*).—This portion of a more extended report deals with the control of Peronospora by use of Bordeaux and Burgundy mixtures, and of Oïdium by use of finely pulverized sulphur.

Arricciamento of elm and hackberry, E. Pantanelli (*Staz. Sper. Agr. Ital., 51 (1918), No. 3–6, pp. 214–219, pls. 2*).—A description is given of abnormal development in elm and hackberry resembling in the latter, more than in the former, the court-noué of grapevines. Numerical comparisons are given as to development, also an account of abnormalities in the leaves as to their development and coloration.

Soil disinfection with hot water to control the root-knot nematode and parasitic soil fungi, L. P. Byars and W. W. Gilbert (*U. S. Dept. Agr. Bul. 818 (1920), pp. 14, pls. 5*).—This is a detailed account of investigations, a summary of which has already been noted (E. S. R., 42, p. 243).

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Animals injurious and beneficial to agriculture, G. Guénaux (*Animaux Nuisibles et Animaux Utiles a l'Agriculture. Paris: J. B. Baillière & Sons, 1919, 2. ed., rev. and enl., pp. XII+312, figs. 126*).—This volume, which is one of the series of Encyclopédie Agricole published under the direction of G. Wery, deals with mammals, reptiles, and batrachians.

Birds of eastern Canada, P. A. Taverner (*Canada Dept. Mines, Geol. Survey Mem. 104 (1919), pp. III+221, 273–297, pls. 50, figs. 68*).—This work, which the author states "although not a scientifically complete check-list of the birds of eastern Canada . . . is nearly so" contains descriptions of 768 forms, and illustrations in color by F. Hennessey of 100 birds.

An illustrated descriptive key for use in identification is included.

Studies on the carnivorous slugs of South Africa, including a monograph on the genus Apera, and a discussion on the phylogeny of the Aperidæ, Testacellidæ, and other agnathous Pulmonata, H. Watson (*Ann. Natal Mus., 3 (1915), No. 2, pp. 107–267, pls. 18, figs. 7*).—In this monograph three species and three subspecies of the genus Apera are described as new.

On the endemic tsutsugamushi disease of Formosa, J. Hatori (*Ann. Trop. Med. and Parasitol., 13 (1919), No. 3, pp. 233–258, pls. 2, figs. 2*).—The author concludes that in the Karenko District of Formosa, where it is epidemic, this disease is transmitted by a minute red mite identical with the Japanese tsutsugamushi or akamushi, namely, the larva of *Leptotrombidium* (or *Trombicula*) *akamushi*.

"In the endemic area in Formosa, the red mites are found in nature parasitic on such rodents as *Mus rattus rufescens* (the common house rat of the island), *M. decumanus*, *M. musculus*, *M. agrarius*, etc., or on such insectivora as *Crocidura muschata*, commonly swarming in the interior of the ear of the animals. Sometimes pheasants, chickens, and even dogs and cats, are infested by the mites.

An account of this mite by Miyajima and Okumura has been previously noted (E. S. R., 39, p. 870). A description of the species is given by the author. A list of 41 references to the literature is appended.

[Insects of economic importance in St. Lucia], J. C. Hutson (*[Imp. Dept. Agr. West Indies], Agr. Dept. St. Lucia Leaflet 11 (1918), pp. 9*).—Three papers are here presented, namely, Black Weevil Borer [*Cosmopolites sordidus*] of Banana (pp. 2–6), Other Insects Attacking the Banana, Plantains, Etc. (pp. 6, 7), and Insects Attacking Other Crops (pp. 7–9).

Reports of the entomologist, W. H. Patterson (*Govt. Gold Coast, Rpt. Agr. Dept., 1915, pp. 19–21; 1916, pp. 19, 20; 1917 pp. 16–18; 1918, pp. 20, 21*).—These report briefly upon the more important insect enemies of cacao, oil palms, coconuts, citrus fruits, etc.

Insect enemies of rice [in Portuguese East Indies], P. Correia Afonso (*Bol. Agr. [Portuguese East Indies], 1 (1919), No. 2, pp. 113–123, figs. 9*).—A brief account of the more important insect enemies of rice, including *Spodoptera mauritia* (*chapra*), *Parnara mathias*, *Melanitis ismene*, *Nymphula depunctalis*, *Lepticorisa varicornis*, *Hieroglyphus furcifer* [*H. banian*], and *Schoenobius bipunctifer* an account of which by Shiraki has been previously noted (E. S. R., 42, p. 55).

Winter work in shade tree insect control.—Methods of determining infested areas, J. S. Houser (*Mo. Bul. Ohio Sta., 4 (1919), No. 11, pp. 345–350, figs. 2*).—It is pointed out that much can be accomplished through the location and marking of insect infestations while the trees are dormant.

The anatomy of the head and mouth parts of Psylla mali, the apple sucker, with some remarks on the function of the labium, A. J. Grove (*Parasitology, 11 (1919), No. 3-4, pp. 456-488, pls. 3, fig. 1*).—An anatomical study of this European insect, which according to Brittain has recently become established in North America (E. S. R., 41, p. 755.)

Apple-grain aphis, A. C. Baker and W. F. Turner (*Jour. Agr. Research [U. S.], 18 (1919), No. 6, pp. 311-324, fig. 1*).—This paper, a contribution from the Bureau of Entomology of the U. S. Department of Agriculture, reports life history studies of the apple-grain aphis, which has been known as the oat aphis or apple bud aphis, made at Vienna, Va., during the years 1914 to 1916.

Systematic studies based on the Fitch types and European material, made in connection with the biological work, have shown that this form, previously known as *Aphis avenæ*, should be called *Rhopalosiphum prunifoliæ* (Fitch). It is said that sufficient work has been completed to indicate that a number of species, very similar in their summer generations on grains, have in the past been confused. Among those confused with *R. prunifoliæ* of Fitch, which winter upon the apple and migrate to grain and grasses, are (1) *R. padi* (L), which is abundant in Europe upon the bird cherry and migrates to grains and grasses in the summer, of which *A. avenæ* Fab. is a synonym and probably also *A. pseudoavenæ* Patch; and (2) *A. cerasifoliæ* Fitch, a common form on our choke cherries, which in its summer forms on grass is almost indistinguishable from *R. prunifoliæ* and *R. padi*. It is stated that a number of other species very similar in their summer forms are either undescribed or their life histories are not fully worked out.

The studies are reported under the headings of the egg, stem mother, spring forms, spring migrant, summer forms, including apterous, intermediate, and alate, fall forms, fall migrant, ovipara, sexes, oviposition, and feeding of ovipara.

The eggs of this species are found mainly on the small branches of the lower portions of the trees, though in heavy infestations they may be found in similar locations all over the trees. In the spring of 1915 the eggs began hatching at Arlington, Va., about March 15 and at Vienna about March 27, but all the young which emerged at Vienna before April 8 succumbed during a period of cold weather. Hatching was most rapid between April 5 and 7, and nearly all the eggs had hatched before April 8.

The average duration of the nymphal period was 13 days. The total length of the life of the stem mother varied from 23 to over 49 days, with an average for 7 insects of 38.4 days. The average number of young produced by 7 stem mothers was 99 in an average of slightly less than 19 days. During the season of 1915 four generations of this species after the stem mother were reared on apples, and migrants appeared in all generations.

"Of 101 aphids reared to maturity in the second generation 89.1 per cent were alate. In the third generation, of 84 insects 58.4 per cent were alate. In the fourth generation 98.5 per cent were alate, only 1 insect out of 67 being apterous. All young from this single apterous aphid of the fourth generation bore wings, and during the season of 1914 all insects of the fourth generation were winged. This seems to be the normal condition."

"The average duration of the nymphal period of the spring apterous form was 8 days, varying from 7 to 9." The average reproduction of six spring apterous forms was 73.5 young. The length of the nymphal period of the spring migrants varied from 8 to 12 days, with an average of 8.86 days. In 1915 the spring migration began about May 1 and continued until about June 7. No attempt was made to determine the species of Gramineæ on which this insect spends the summer, but it lived easily on both oats and wheat. The average number of young produced by the spring migrant was 13.5.

Only the apterous summer vivipara produced the fall forms, no alate insect occurring in the experiments at a late enough period for such production. Sixteen fall migrants produced an average of 5.9 young apiece, the number varying from 4 to 8. The oviparous form matured very slowly in comparison with earlier forms of the year, requiring a period of from 16 to 20 days to reach maturity. The greatest number of eggs produced by one mother in the experiments was 7.

A general account of this insect, by Davis, including a summary of its life history, has previously been noted (E. S. R., 31, p. 753).

A descriptive catalogue of the scale insects (" Coccidæ ") of Australia, I, W. W. Froggatt (*Dept. Agr. N. S. Wales, Sci. Bul. 14 (1915), pp. 64, pl. 1, figs. 37*).—One hundred fourteen species of which 17 are new to science, representing 12 genera, are recorded from Australia.

An imported feeder on stored peanuts, E. R. de Ong (*Jour. Econ. Ent., 12 (1919), No. 5, p. 407*).—A gallerid moth (*Paralipsa, Melissoblates*) *Aphomia gularis* Zeller, resembling the Mediterranean flour moth, was found heavily infesting peanuts, about 500 tons of which had been imported from China and stored in a warehouse for a period of six months. Loss was caused by the destruction of the peanut kernel and the presence of frass and webbing on the uneaten nut, the deterioration being so marked that the most heavily infested portions were condemned by the food inspector.

This moth was described in 1877 from Japan and is recorded from China, India, and Vladivostock, but has not previously been recorded from the United States.

Anopheles crucians as an agent in malaria transmission, C. W. Metz (*Pub. Health Rpts. [U. S.], 34 (1919), No. 25, pp. 1357–1360*).—The author considers the data presented to leave no doubt as to the susceptibility of *A. crucians* to infection with malaria plasmodia under natural conditions. The evidence of its susceptibility of infection in nature indicates that this species is potentially of definite sanitary importance.

Observations on the habits of certain flies, especially of those breeding in manure, J. E. M. Mellor (*Ann. Appl. Biol., 6 (1919), No. 1, pp. 53–88, figs. 10*).—In this report of investigations the author discusses the hibernation of the house fly, winter observations of flies, distribution of flies during summer and autumn, observations on horse manure heaps in summer, use of creosote oil mixture to prevent fly development, and burial of material infested by fly larvæ. Thirty-nine species of flies were reared from larvæ or pupæ found in natural situations during the winter, of which 31 are additional to the 1916 list by Graham-Smith (E. S. R., 36, p. 256).

It was found that "creosote oil mixture should be sprayed 'incrementally' and not merely on the surface. It is doubtful whether 1 gal. to the ton of manure is sufficient to prevent flies from emerging. Four gal. proved enough, but it was not possible to carry out sufficient experiments to determine the precise minimum quantity necessary to prohibit development of flies. Incremental applications of creosote oil mixture and of borax lower the general temperature of the heap. The temperature never rises as high and takes much longer to fall as low. This is probably due to fermentation being delayed.

"If a heap is sprayed on the surface with creosote oil mixture, *Musca domestica* larvæ are able to live between the sprayed surface and the intense heat below. The temperature 1 in. below the surface of the manure, when that of the heap is near its maximum, is about 41° C., a temperature of which Howlett wrote 'it is improbable that they (larvæ) could live long at anything over 41° C. (about 106°F.)'—see Copeman (1916) [E. S. R., 36, p. 656].

"It is useless to bury larvæ-infested material at a depth of 4 ft. in clay, loam, or sand, whether loose or rammed down, as the majority of flies will emerge. About 90 per cent of the larvæ, so buried, climbed to within 1 ft. of the surface before pupating.

"The following parasites were bred: From two pupæ of *Hydrotæa dentipes*, two ichneumons (*Atrodectes tenebricosus* ♀, *A. exilis* ♂); from a third pupa of *H. dentipes*, a figitid; from pupa of *Lonchæa vaginalis* or *Anthomyia radicum*, an ichneumon; from two Calliphora-like pupæ, one and two figitids, respectively; and from three pupæ of *Eristalis tenax*, 72 (10♀, 62♂), 24, and 8 (5♂, 3♀) proctotrypids, *Diapria conica*, were extracted dead."

A list of 26 references to the literature is included.

On the life history and larval anatomy of Melinda cognata (Diptera Calliphorinæ) parasitic in the snail Helicella (Heliomanes) virgata, with an account of the other Diptera living upon mollusks, D. Keilin (*Parasitology, 11 (1919), No. 3–4, pp. 430–455, pls. 4, figs. 6*).—The first part of this paper consists of a complete account of the life history and a description of the early stages of a tachinid fly (*M. cognata*), which the author found in Cambridge, England, living as a parasite on a common snail (*H. virgata*). The second part consists of a review of all observations made hitherto on the life history of different flies feeding upon living or dead mollusks.

The cottonwood leaf-mining beetles in southern Alberta, E. H. Strickland (*Canad. Ent., 52 (1920), No. 1, pp. 1–5, figs. 4*).—*Zeugophora scutellaris* and *Z. abnormis* are said to attack and disfigure the foliage of cottonwood and poplars in southern Alberta and Saskatchewan, where these trees have proved to be best adapted for shade and ornamental purposes. These leaf-mining beetles do not entirely pierce the leaves but extend to the upper epidermis, which appears as a transparent membrane when held to the light. *Z. scutellaris* feeds most abundantly on cottonwoods, though it is found sparingly on other poplars, whereas *Z. abnormis* is rarely seen on cottonwoods but confines its attention chiefly to balm of Gilead.

Brief notes are presented on the life history and habits of the two species. The eggs, particularly of *Z. abnormis*, are parasitized by a mymarid, over 40 per cent having been recorded as attacked. A hymenopterous parasite was also found in large numbers of the larvæ examined. In experiments with arsenicals, Paris green at the rate of 1 oz. to 4 oz. of slaked lime and 10 gal. of water was the most effective.

Notes on the larvæ and life histories of prionine beetles.—Coleoptera, Cerambycidæ, Prionini, C. F. C. Beeson (*Indian Forest Rec., 7 (1919), No. 5, pp. 23, pls. 2, fig. 1*).—This paper deals with the anatomical characters of larvæ of the Prionini, their economic importance, identification, and notes on their life history.

The fig and willow borer (Phryneta spinator)., D. Gunn (*Union So. Africa, Dept. Agr. Bul. 6 (1919), pp. 22, figs. 16; also in Agr. Jour. So. Africa, 1919, Oct., pp. 11–25, figs. 14*).—This is an account of a borer which for many years has been a pest of fig and willow in South Africa in many localities, having seriously interfered with the success of fig trees year after year. In addition to willow and fig (its principal food plants), it sometimes injures apple, peach, pear, and plum trees, and grapevines.

The eggs are deposited in slits cut in the bark of fig and willow trees. On hatching out the larvæ feed first upon the tissue surrounding the egg slits, then burrow into the wood where they remain for about 2.5 years, the full life cycle requiring a period of slightly over 3 years.

Before preventive measures are undertaken the larvæ may be destroyed by means of a sharp knife and a piece of strong flexible wire. In case a larva burrows deeply into the roots it may be killed by injecting a small quantity of carbon bisulphid or paraffin into the burrow, closing the entrance with either cotton, wool, or clay. The tree should then be protected from further attack by placing a piece of fine wire netting around the stem, the lower end resting upon the roots. Cultural methods are said to be of importance in controlling the borer.

Field trials for the prevention of damage to crops by wireworms and leatherjackets, R. A. H. Gray and R. W. Wheldon (*Jour. Newcastle Farmers' Club, 1919, pp. 89–98*).—The authors report that both wireworms and leatherjackets did considerable harm on many fields plowed out from turf, the crops in many cases being entirely destroyed.

"Where crops are attacked by leatherjackets the damage is usually most marked till the end of May or the beginning of June, when many of the grubs go into the pupa stage and cease to do harm. If the crop at this time is not too seriously damaged there are prospects of its recovery. Neither naphthalene nor the insecticide [containing naphthalene] applied in quantities up to 5 cwt. an acre got rid of or even appreciably reduced the number of wireworms or leatherjackets. Where land was well plowed and a good tilth had been obtained for the oats the crop generally grew in a satisfactory manner. Where the land had been badly plowed and the furrows had not been broken up the damage by wireworms and leatherjackets was very severe. This is probably accounted for by the fact that where oats are sown under good conditions the plants grow away quickly and are able to withstand the attack of wireworms; where the conditions for the oat plants are not good the plants grow much more slowly and are much weaker and succumb more readily when attacked by the pests.

"Late plowing has not given such good results as early plowing, especially on strong land. This is probably because a good tilth can not readily be obtained after late plowing.

"Barley is not such a satisfactory crop to grow on land after old turf, affected by wireworms and leatherjackets, as a good tillering oat like Sandy or Blainslie." Good tillering oats are more likely to produce a crop when attacked by wireworms or leatherjackets than nontillering oats. Beans are attacked by wireworms, both the seed and the plant being damaged. Wireworms may give trouble on newly-plowed land for two or three years or even longer, whereas leatherjackets are injurious for only one year on newly-plowed pastures.

Methods of cultivation for controlling wireworm and leatherjacket attacks, R. A. H. Gray (*Jour. Newcastle Farmers' Club, 1918, pp. 65–69*).—A brief report of control work.

The glow worm and other beetles, J. H. Fabre, trans. by A. Teixeira de Mattos (*New York: Dodd, Mead & Co., pp. [VI]+488*).—This volume, which did not form part of the author's Souvenirs Entomologiques as originally published, is the second on beetles, the first of which has been noted (E. S. R., 40, p. 552), in the complete English edition of Fabre's entomological works.

The white fly eating Delphastus, J. R. Watson (*Fla. Grower, 20 (1919), No. 24, pp. 8, 9*).—A ladybird beetle (*Delphastus catalinæ*) which has been introduced from California into the citrus groves of Florida is said to have become established at Brandentown, Lakeland, and Crescent City, and to feed readily upon the eggs and larvæ of the citrus white fly. See also a previous note by Smith and Branigan (E. S. R., 37, p. 58).

Notes on Sphenophorus (Coleoptera), F. H. Chittenden (*Proc. Biol. Soc. Wash., 32 (1919), pp. 269, 270*).—*Sphenophorus costicollis* and the variety *callosipennis* from New Orleans, La., are described as new.

A new parasitic cynipid reared from a clover aphid, L. H. Weld (*Ent. News, 31 (1920), No. 1, pp. 14–16*).—*Charips (Charips) leguminosa* reared from *Aphis bakeri* at Twin Falls, Idaho, by R. H. Smith is described as new. The fact that this species was reared on two occasions in cages with *Aphelinus lapsiligni*, the most important parasite of *A. bakeri*, is said to have led Smith to conclude that *C. leguminosa* is not a primary parasite but is parasitic on *A. lapsiligni*.

Labenidæ, a new family in the Ichneumonoidea, H. L. Viereck (*Ent. News, 31 (1920), No. 1, pp. 16–19*).

The imported red spider (Paratetranychus pilosus) attacking apple foliage, S. W. Frost (*Jour. Econ. Ent., 12 (1919), No. 5, pp. 407, 408*).—This spider mite, which has been reported from Canada but not previously from the United States, is said to have become established on apple in Adams County, Pa. Reports of similar injury have been received from Franklin County, Pa.

FOODS—HUMAN NUTRITION.

Scientific problems of nutrition in France during the war, R. Legendre (*Problèmes Scientifiques d'Alimentation en France Pendant le Guerre. Paris: Masson & Co., 1919, pp. 160*).—This volume contains the reports of the meetings of the committee on nutrition of the Society of Biology (France) from May 25, 1918, to March 1, 1919, and an annotated bibliography of French publications on nutrition during the war (1914–1918).

Nutrition problems, H. Wolff (*Ztschr. Angew. Chem., 32 (1919), No. 48, Aufsatzt., pp. 185–188, figs. 3*).—A theoretical discussion of various problems of nutrition, including the protein requirement, the need of the body for fat, the relative value of animal and vegetable food materials, psychic factors involved in nutrition, the quality of food, etc.

Judging food from a chemical and physical standpoint, M. Rubner (*Ber. Deut. Pharm. Gesell., 29 (1919), No. 6, pp. 434–458*).—In this theoretical discussion some of the changing phases of nutritional problems are discussed. Suggestions are made as to the need of further investigation along certain lines, including an expansion of the analysis of food materials leading particularly to a differentiation of carbohydrates and a distinction between protein and nonprotein nitrogen, more extended work on relative digestion and absorption of food materials in different combinations, and a study of the question of the specific dynamic action of the proteins. In conclusion, a protest is raised against the substitution of other values than the calorie as the unit of food value.

Food from grains, A. Maurizio (*Die Nahrungsmittel aus Getreide. Berlin: Paul Parey, vol. 1, 1917, pp. XII+464, pls. 2, figs. 182; vol. 2, 1919, pp. IX+213, pl. 1, figs. 6*).—This work is designed to take the place of the handbook on grain, flour, and bread previously noted (E. S. R., 14, p. 785). It differs from the earlier work principally in the more complete treatment of the subject of the nutritive value of cereal products. The first volume deals with the physical, chemical, and histological properties of the cereal grains, the preparation of meal and flour and the problems of their storage, the fermentation of dough, and the baking of bread. The second volume discusses the nutritive value of bread, and the preparation, composition, special properties, and nutritive value of special breads, cereals, noodles, maize, and rice. In connection with the latter the possible relationship of maize consumption to pellagra and of polished rice to beriberi is discussed.

The digestibility of the branny coats of wheat, C. H. Briggs (*Science, n. ser., 50 (1919), No. 1297, pp. 427–429*).—The author's conclusion from this summary of data is that the branny portion of the wheat has practically no nutritive value for human beings.

Availability of carbohydrate in certain vegetables, W. H. Olmsted (*Jour. Biol. Chem., 41 (1920), No. 1, pp. 45–58*).—Vegetables usually used in low carbohydrate diets for diabetic patients were analyzed for their carbohydrate content by feeding to phloridzinized dogs and by hydrolysis with taka-diastase followed by acid hydrolysis and determination of glucose by Fehling's solution. The amounts of available carbohydrates in the vegetables tested are given in the following table:

Available carbohydrate in certain vegetables.

Kind of vegetable.	Taka-diastase.	Phloridzinized dog.	Kind of vegetable.	Taka-diastase.	Phloridzinized dog.
	Per cent.	*Per cent.*		*Per cent.*	*Per cent.*
Cabbage	4.4	5.0	Cauliflower thrice cooked	0.8	0.8
Cabbage thrice cooked	.4	.5	Spinach	....	1.2
Cauliflower	2.8	3.4	Lettuce	1.0	....

The nutritive value of the banana, II, K. Sugiura and S. R. Benedict (*Jour. Biol. Chem., 40 (1919), No. 2, pp. 449–468*).—Continuing the study previously noted (E. S. R., 40, p. 67), it has been found that a diet consisting of bananas 83, casein 16, yeast 0.5, and protein-free milk 0.5 per cent is adequate for the growth, maintenance, reproduction, and perfect milk production of albino rats. This is thought to indicate the presence in protein-free milk of a water-soluble accessory factor lacking in yeast and which is necessary for suitable milk production. The substance is apparently not associated with purified milk sugar or with the inorganic constituents of milk.

The experiments reported suggest that a combination of bananas and milk, in proper proportion, constitutes a complete food.

A possible new source of food supply, P. W. Claassen (*Sci. Mo., 9 (1919), No. 2, pp. 179–185, figs. 4*).—Information regarding the use by the American Indians of the starchy rhizomes of the common cat-tail (Typha) is summarized, and the question of the possible use of cat-tail starch as food is discussed.

The author made tests of the yield of rhizomes per acre, also of the starchy material of the inner portion of the rhizome and the use of this finely ground material in cookery. He states that dishes made from cat-tail flour were "pleasing and palatable." Analyses made for the author are reported, the average of three being as follows: Moisture 7.63, protein 6.89, fat 3.09, carbohydrate 81.44, and ash 2.56 per cent.

Ripe olives a safe food, W. V. Cruess (*Univ. Cal. Jour. Agr., 6 (1920), No. 2, pp. 15, 16*).—A brief description is given of the process of pickling ripe olives, with particular emphasis on the time and temperature of sterilization.

"Ripe olives have received of late unfair publicity as regards sterilization and methods of preparation. As a matter of fact more care is taken in their preparation and a longer time and higher temperatures of sterilization are used than with any other canned fruit."

Spices and their substitutes during the war, A. BEYTHIEN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 38 (1919), No. 1–2, pp. 24–33*).—The author discusses the excessive prices charged for imported spices in Germany (Dresden) during the war, and the materials used for their adulteration.

Bakery report, F. C. HIMMER (*North Dakota Sta. Spec. Bul., 5 (1919), No. 15, pp. 368–373*).—This is the report of investigations of two North Dakota bakeries in which the cost of the finished product was unusually high, 12.35 cts. and 12.38 cts., respectively, for one 1.5-lb. loaf. In the first case this was traced to high overhead charges due to underproduction, and in the second to the use of a large amount of milk and a high-priced flour. The net profit at the first bakery, calculated for a period of 4 months and 24 days, was on cost 15.95 per cent and on retail 12.71 per cent. In the time covered by the investigation of the second bakery, 1 month and 2 days, the net profit was on cost 21.75 per cent and on retail 16.5 per cent. The first bakery was operating at only about one-half its capacity, while the second was operating at full capacity. This is thought to account for the greater profit in the latter bakery and to indicate the value of running a plant to its full capacity.

Manual of good cookery and good management, P. MONTAGNE (*Manuel du Bon Cuistot et de la Bonne Ménagère. Paris: Marc Imhaus et René Chapelot, 1918, pp. IV+199*).—The construction and use of camp cooking equipment (including simply constructed fireless cookers and like devices), cooking processes, dietary requirements, and similar questions are discussed, and recipes are given for the preparation of a large number of dishes.

The author recognizes the importance of tasty dishes and palatable meals. Since the volume includes large-quantity recipes it should prove of interest in the consideration of institution cookery problems as well as for its original purpose.

Food for a family of five, M. GREIG (*Nat. Hist., 19 (1919), No. 3, pp. 337–339, figs. 5*).—An account is given of an educational exhibit prepared for the American Museum of Natural History, in New York.

Menus compiled by dietitian for officers' hall and maids' and helps' cafeteria [of a recently opened hotel in New York City] (*Hotel Mo., 27 (1919), No. 321, pp. 58–60*).—These menus for a week are included in a descriptive article, discussing equipment and operation of a large hotel recently constructed. Much attention is given to the food and the dining room management, laundry, and other home economics problems. To meet a demand for home-cooked food a special kitchen has been equipped where such dishes are prepared.

Dietary studies made in the Missouri State hospitals for the insane, J. FINDLEY (*Mod. Hosp., 11 (1918), No. 4, pp. 306–308*).—A study of four hospitals showed that there was need for improvement in the food served in three of them, not enough fresh fruit and vegetables being included in their menus. The fourth hospital, the only one in charge of a dietitian, showed much better balanced menus. Sample menus are given.

Food waste in hospitals, C. S. PITCHER (*Mod. Hosp., 11 (1918), No. 6, pp. 491–496*).—Practical suggestions for eliminating food waste in hospitals and institutions, the use of basic quantity tables for issuing food supplies, and the adoption of an accurate waste accounting system are advocated.

[Food problems in public health work in South Africa] (*Pub. Health Rpts. [U. S.], 35 (1920), No. 2, pp. 69, 70*).—In line with public health work of Great Britain and the Dominion of Canada, the recently established act for public health work in South Africa includes public water supplies, meat, milk, and other articles of food, and sanitation and housing.

The effect of food restriction during war on mortality in Copenhagen, M. HINDHEDE (*Jour. Amer. Med. Assoc., 74 (1920), No. 6, pp. 381, 382*).—The author presents data to show that during the year of greatest food restriction (October, 1917, to October, 1918), the death rate for Denmark was 10.4 per thousand as against the lowest previous rate of 12.5 for 1913 and 1914. This lowering of the death rate is attributed to the low protein (mostly vegetarian) diet necessitated by the Danish food regulations, and particularly to the unusual amount of bran consumed during the period of food restriction. This was brought about by milling rye to 100 per cent and adding to it wheat bran and 24 per cent of barley meal milled to 95 per cent. With this mixture it is stated that excellent bread was obtained which produced no digestive troubles.

The author concludes that "as bran can replace meat and eggs, man should eat whole bread and not so much of the more costly foods," thus differing, as he points out, from the conclusions of Osborne, Mendel, et al. (E. S. R., 41, p. 261) that it is inadvisable to incorporate bran in the flour to be used for human consumption.

Protein requirement of maintenance in man and the nutritive efficiency of bread protein, H. C. SHERMAN (*Jour. Biol. Chem., 41 (1920), No. 1, pp. 97–109*).—To obtain the best indication of the normal protein or nitrogen requirement for man the author, with the cooperation of L. H. Gillet and E. Osterberg, has averaged the observed nitrogen output in all available experiments in which the intake appears to have been barely sufficient or not quite sufficient to result in equilibrium of intake and output, and in which the energy value of the experimental ration was at least approximately adjusted to the energy requirement of the subject.

Excluding all experiments showing a loss of body nitrogen greater than 1 gm. per day, there remained 109 experiments belonging to 25 different investigations, and including 67 experiments upon 29 men, and 42 upon 8 women subjects. The total nitrogen output per day (urine and feces) was computed to a basis of 70 kg. of body weight and multiplied by 6.25 to express the "indicated protein requirement."

The 67 experiments upon men and the 42 experiments upon women show an average indicated protein requirement of 0.633 gm. and 0.637 gm., respectively, per kilogram of body weight, thus indicating that it is not necessary to distinguish between the sexes when the requirement is calculated to a uniform basis of body weight. The general averages of the entire 109 experiments with individual data ranging from 21 to 65 gm. of protein per 70 kg., of 94 experiments within the limits of 29 to 56 gm. per 70 kg., and of 76 experiments within the limits of 30 and 56 gm. per 70 kg. were, respectively, 0.635, 0.61, and 0.58 gm. per kilogram, or in round numbers 45, 43, or 41 gm. per man of 70 kg. weight per day. The author considers that there would be a smaller probable error in estimating the average daily protein requirement at about 0.6 gm. per kilogram or 42 gm. per 70 kg. than at any higher figure.

Comparing these average results with the data obtained in the author's laboratory on the efficiency of maize protein (E. S. R., 39, p. 873), of oat protein (E. S. R., 41, p. 768), and of wheat protein, the data upon which are reported in the present article, it is shown that with all three of the cereal grains tested a diet in which about nine-tenths of the protein was derived from the cereal in the form commonly used as human food, the small remainder being furnished by milk or apple, need contain only 33 to 40 gm. of protein per 70 kg. of body weight, or about 0.5 gm. per kilogram, in order to meet the protein requirement of maintenance in adult human nutrition. Consequently, there seems to be no necessity for discriminating against bread protein as compared with the protein of staple foods in general in so far as the requirements of adult maintenance alone are concerned. It is pointed out that this is in harmony with the findings both of Osborne and Mendel and of McCollum and his associates on the amount of grain protein required for adult maintenance in rats when stated in terms of the total calories of food consumed. In this connection the author discusses the essential differences between protein requirement for growth and for maintenance, stating in conclusion that "it is plainly desirable in all cases that grain products be supplemented by milk products, and it is clear that in providing for needs of growing children and of pregnant or nursing mothers the proportion of milk in the diet should be more liberal than it need be when only maintenance is concerned; this both because of the superior amino-acid makeup of the milk proteins and to provide amply for the mineral elements and vitamins as well."

Complementary factors of growth and equilibrium, and diastatic action, R. THIÉBAUT (*Presse Méd.* [*Paris*], *No. 79* (*1919*), *pp. 795, 796*).—The author proposes as an explanation of the manner in which vitamins contribute to the metabolism of cellular life, the theory that they are indispensable to the action of diastases. Assuming that the diastatic action depends upon the special distribution of the electrodes on the surface of colloidal substances, the absence of the factors A and B might bring about a disintegration of the colloidal substance in such a manner as to produce a disturbance in the particular distribution of the electrons on the surface, thus making it impossible for the diastase to act. For this reason the author prefers the term complementary factors to accessory factors in designating vitamins and auximones.

Vitamins in human nutrition, E. B. FORBES (*Mo. Bul. Ohio Sta.*, *4* (*1919*), *No. 10*, *pp. 299–305*; *also in Chem. Age* [*New York*], *2* (*1920*), *No. 1*, *pp. 348–350*).—In this general discussion of the subject the author points out that by far the most important bearing of the facts as to the vitamins is not in relation to the specific diseases beriberi, xerophthalmia, and scurvy, but in relation to growth, efficiency, general tone, and resistance. "It is in the slight and unrecognizable departures from the normal that these dietary deficiencies must work their greatest injury."

On the identity of the water-soluble growth-promoting vitamin and the antineuritic vitamin, H. H. MITCHELL (*Jour. Biol. Chem.*, *40* (*1919*), *No. 2*, *pp. 399–413*).—The author reviews and discusses the literature on the occurrence and properties of the water-soluble, growth-promoting vitamin and the antineuritic vitamin and concludes that "there seems to be very good reason for doubting their identity. In settling the question definitely, however, there is need of experiments in which different foods and preparations from foods are tested both for their growth-promoting properties and their curative effects on polyneuritic pigeons. Until such work is done in a quantitative way, dogmatic assertion that a lack of water-soluble B leads to polyneuritis or beriberi, or an interchangeable use of the terms 'water-soluble B' and 'antineuritic vitamin' serves no purpose, tending rather to impede progress in this direction."

Fat-soluble vitamin.—II, The fat-soluble vitamin content of roots, together with some observations on their water-soluble vitamin content, H. STEENBOCK and E. G. GROSS (*Jour. Biol. Chem.*, *40* (*1919*), *No. 2*, *pp. 501–532*, *pl. 1*, *figs. 36*).—Continuing the studies on fat-soluble vitamin previously noted (E. S. R., 39, p. 770), the relative amounts of the vitamin present in various tubers and roots have been determined by incorporating various percentages of them in a basal rat ration satisfying all other nutritive requirements.

The experimental data obtained indicate that the vitamin relations in roots and tubers may be of a widely differing nature. With 15 per cent of the diet consisting of roots as the source of the fat-soluble vitamin, complete failure resulted in the case of the rutabaga, dasheen, red beet, parsnip, potato, mangel, and sugar beet, but normal growth and rearing of the young resulted in the case of the yellow sweet potato and carrot. It is pointed out that the positive results obtained with the last mentioned substances warrant the conclusion that tubers and roots are not necessarily to be classed with food materials grossly deficient in their fat-soluble vitamin content, but in some instances should be placed in the same class with leafy materials rather than with cereal grains.

In the experiments reported no relation could be noted between the amounts of fat-soluble and water-soluble vitamins occurring in the various materials studied. In dasheens no fat-soluble vitamin could be demonstrated, although 15 per cent furnished enough of the water-soluble vitamin. In carrots enough of both vitamins was furnished by an amount equivalent to 15 per cent of the ration, and in mangels and sugar beets neither vitamin could be demonstrated at a 25 per cent level. "From the standpoint of plant physiology it is difficult to surmise just what these relations signify, but most certainly it does not appear justifiable to associate generally great physiological activity with an abundance of vitamins."

Fat-soluble vitamin.—III, The comparative nutritive value of white and yellow maizes, H. STEENBOCK and P. W. BOUTWELL (*Jour. Biol. Chem., 41 (1920), No. 1, pp. 81–96, pl. 1, figs. 7*).—This paper, in continuation of the above series, furnishes data in confirmation of the hypothesis advanced by the senior author (E. S. R., 42, p. 257) that the fat-soluble vitamin is closely associated with the occurrence of yellow pigment.

Yellow maize was found to furnish enough of the fat-soluble vitamin to allow growth at the normal rate to take place in the rat and to make possible reproduction but not rearing of the young. White maize under similar conditions produced absolute nutritional failure. Red maize with a white endosperm gave the same results as white maize, and with a yellow endosperm the results approximately those of yellow maize.

The clinical rôle of the fat-soluble vitamin: Its relation to rickets, A. F. HESS and L. J. UNGER (*Jour. Amer. Med. Assoc., 74 (1920), No. 4, pp. 217–223, figs. 8*).—The authors report a study of rickets in about 100 infants cared for in a modern child-caring institution. The plan of the investigation, which has been in progress for about a year and a half, consisted in placing the different groups of infants on various diets, including those selected to furnish an abundance of fat and fat-soluble vitamin in the form of milk and cream; a deficiency of these substances, as in skim milk; an abundance of water-soluble vitamin, as supplied by autolyzed yeast; and diets such as Mellen's food or condensed milk. Each diet was adequate in its calorific content and contained sufficient antiscorbutic foodstuff, and the hygienic conditions under which all the subjects lived were excellent. Examination for rickets was made once a month, and included notation as to the size of the fontanel, the beading of the ribs, the enlargement of the epiphyses, the condition of the musculature, the eruption of the teeth, the static development, etc.

The results of the study indicated that the fat-soluble vitamin, contrary to the conclusion of Mellanby (E. S. R., 41, p. 364), is not the controlling influence. In several cases infants developed rickets while receiving a full amount of this principle, and in other cases showed no signs of the disease although deprived of this vitamin for many months. The only abnormal condition observed in the latter cases was a mild retardation in gain in weight, which was promptly overcome by the use of a larger amount of wheat cereal (Cream of Wheat) lacking in fat-soluble vitamin.

In discussing these results and comparing them with the observations of others the authors point out the danger of attributing every unexplained growth impulse to the vitamins, and the necessity of bearing in mind that there are other little understood factors and food reactions, one of which is the peculiar rôle that cereal plays in the nutrition of the infant.

"Finally, this work seems to show that the danger to infants of a diet deficient in fat-soluble vitamin is slight, provided it includes sufficient calories and otherwise is complete. They can maintain their health and vigor despite amounts of fat-soluble vitamin so small as rarely to be encountered in times of peace. In spite of the fact, therefore, that this vitamin is not widely distributed in nature, a disorder that may be termed 'fat-soluble deficiency'—marasmus or xerophthalmia—is hardly to be apprehended from a clinical standpoint."

The causation and treatment of rickets, E. Pritchard (*N. Y. Med. Jour., 110 (1919), No. 23, pp. 921–924*).—Essentially noted from another source (E. S. R., 42, p. 367).

Cystolithiasis among Filipinos in association with dietetic deficiency, R. G. Padua (*Philippine Jour. Sci., 14 (1919), No. 5, pp. 481–498, pl. 1, fig. 1*).—Following the suggestion of Osborne and Mendel[1] of a possible etiological relationship between a ration deficient in fat-soluble vitamin and the formation of phosphatic urinary calculi, the author has investigated the chemical composition of Filipino vesical calculi in connection with a study of the nutritional condition of the patients.

The cases studied were classified into 4 groups—(1) 11 cases giving positive history or signs of beriberi, (2) 18 cases with an unreliable history of beriberi but undernourished and from the poorer class, (3) 23 well-nourished and well-developed individuals, and (4) 6 cases of uncertain nutritional condition. A majority of the cases occurred in children and young adults. Uric acid or urate nuclei were found in 6 out of 8 cases over 50 years of age, while phosphates predominated in the earlier decades. The percentage of primary phosphatic calculi was greatest in the individuals belonging to groups (1) and (2), being 45.4 and 72.2 per cent, respectively. Primary urate calculi were most frequently found in the well nourished cases (group 3), occurring in 43.5 per cent of these cases.

"It is apparent, therefore, that the inadequate dietetic conditions among Filipinos and concomitant nutritional disorders such as beriberi favor the formation of phosphatic stones, owing to the low daily protein intake and the lessened acidity of the urine resulting therefrom."

The dairy industry and human welfare, E. V. McCollum (*Hoard's Dairyman, 57 (1919), No. [22], pp. 1033, 1036, figs. 3*).—In this article, which emphasizes the importance of milk in the diet, the author states his belief, as the result of investigations of the occurrence of night-blindness in different parts of the world, that this eye disease is caused by a lack of fat-soluble A in the diet.

Pathology, origin, and cause of pellagra, O. Lubarsch and R. von Ostertag (*Ergeb. Allg. Path. Mensch. u. Tiere, 18 (1915), pt. 1, pp. X+831*).—This is an extensive survey of the literature on the symptomatology, pathological anatomy and histology, and etiology of pellagra. A bibliography is included of 1,472 titles covering the literature on the subject up to and including 1914.

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[1] Jour. Amer. Med. Assoc., 69 (1917), No. 1, pp. 32, 33.

The effects of malt and malt extracts on scurvy and the alkaline reserve of the blood, J. F. McClendon, W. C. C. Cole, O. Engstrand, and J. E. Middlekauff (*Jour. Biol. Chem., 40 (1919), No. 2, pp. 243–258, figs. 8*).—This paper reports the results of an attempt to prepare malt products to serve as antiscorbutics in the absence of fresh foods.

The conclusions of Fürst (E. S. R., 27, p. 567) and of Cohen and Mendel (E. S. R., 39, p. 770) that fresh sprouted barley is rich in antiscorbutic substance were confirmed. It was further found that the greatest potency was obtained when the length of the acrospire was one-half inch or more, that the antiscorbutic substance was not destroyed by heating to 70° C. (158° F.) to gelatinize the starch, and that it could be extracted from the sprouted barley after crushing it between steel rolls so close together that the cells of the acrospire were crushed.

Determinations of the alkaline reserve of scorbutic guinea pigs gave results which were not essentially different from those obtained with healthy guinea pigs, thus indicating that acidosis has nothing to do with the scurvy of guinea pigs.

Deficiency diseases (*Brit. Med. Jour., No. 3074 (1919), pp. 707, 708*).—This paper reports a discussion at a meeting of the section of therapeutics and pharmacology of the Royal Society of Medicine (England) on the treatment and management of diseases due to a deficiency of the accessory factors in diet. The discussion included remarks by F. G. Hopkins with particular reference to scurvy and rickets; by F. D. Boyd on an outbreak of pellagra among Turkish prisoners of war; by W. H. Willcox on the incidence of scurvy and beriberi as it affected the troops of Mesopotamia; by R. L. M. Wallis on a substitute for nutrose (E. S. R., 38, p. 710), which had proved to be protective against beriberi; by H. E. Roaf on the necessity in the treatment of deficiency diseases of seeing that the deficiency substance was properly absorbed; by E. M. Hume on the comparative value of vitamin-containing foods; by M. Delf on the effects of temperature on accessory food factors; and by A. Harden and S. S. Zilva on the antiscorbutic power, respectively, of evaporated orange juice and of lemon juice from which the citric acid and solid matter had been removed.

The pathogenesis of deficiency disease, III–IV, R. McCarrison (*Indian Jour. Med. Research, 7 (1919), No. 1, pp. 167–194, pls. 10, fig. 1*).—In continuation of the investigation previously noted (E. S. R., 42, p. 166), two papers are presented.

III. *The influence of dietaries deficient in accessory food factors on the intestine* (pp. 167–187).—In this paper the pathological changes in the intestine which result from dietaries deficient in accessory food factors have been studied in (1) pigeons fed exclusively on autoclaved milled rice, (2) pigeons fed on autoclaved rice together with fresh butter and onions, (3) pigeons fed on autoclaved rice together with fresh butter, (4) guinea pigs fed on a diet of crushed oats and autoclaved milk, and (5) guinea pigs fed on an exclusive diet of autoclaved rice.

All of the pigeons fed on the first diet, deficient in all three classes of accessory food factors, developed polyneuritis gallinarum. Apart from some degree of atrophy of all coats of the bowel, which was universally found, marked histological changes occurred in 70 per cent of the cases, including congestion and hemorrhage, atrophy of the myenteron, degenerative changes in the myenteric plexus of Auerbach, atrophic and inflammatory changes in the mucous membrane, atrophy of lymphoid structures, fibrosis, and changes favoring systemic infection from the diseased bowel. The second dietary, which was deficient in water-soluble B but contained an abundance of fat-soluble A and the antiscorbutic factor, led to the development of polyneuritis gallinarum. Both the macroscopical and microscopical evidences of congestion, hemorrhage, and other pathological processes were, however, not so marked as in the first study. With the third dietary, deficient in vitamins of the B and C types, typical polyneuritis and pathological changes corresponding to those of the first study resulted, thus indicating that the slight measure of protection afforded by the second dietary was due to the fresh onions furnishing the antiscorbutic factor. This was confirmed by the two series of experiments with guinea pigs on dietaries deficient in the antiscorbutic factor in one case and in all three factors in the other case. The pathological changes produced in the intestines were similar in character and distribution to those in the pigeons, with the exception that the duodenum was usually swollen and turgid instead of being much thinner as in the case of the pigeons. None of the guinea pigs exhibited the characteristic naked eye appearance of scurvy, the condition in a clinical sense being prescorbutic.

Interpreting in terms of bowel function the derangements to which such pathological changes may ultimately lead, the author makes the following grouping:

"Impairment of the neuro-muscular control of the bowel; impaired transport of the intestinal contents along the alimentary canal; impairment of assimilative power; impairment of secretory functions; impaired protective resources leading to infection of the mucous membrane of the bowel by pathogenic saprophites or ingested bacteria, and to systemic infection therefrom."

The changes described are thought to be applicable in some degree to the human subject. "If, in the light of the histo-pathological findings here recorded, we consider the case of children fed, it may be from birth, on foods deficient in these essential substances, and the frequency with which in later life their dietary continues to be ill balanced and defective, we are . . . in a position to realize the ultimate consequences of such a dietary, and to anticipate the sequence of events leading up to grave derangements of bowel function. Food deficiency also prepares the soil for bacterial growth, and the resultant morbid states will vary with the nature of the organisms which may become implanted upon it." As examples of gastro-intestinal disorders which may owe their origin to the long continued subminimal supply of accessory food factors the author discusses mucous disease, celiac disease, and chronic intestinal stasis.

In conclusion certain points of interest are brought out in connection with the therapeutic effects of vitaminic extracts and of such whole grains as "mung dal" (a species of bean). The observation that the nervous symptoms present in polyneuritis gallinarum may be rapidly recovered from and yet the pigeon die in consequence of gastrointestinal lesions is thought to indicate that the nervous system is the least affected as regards organic lesions. The rapidity of recovery brought about by the artificial feeding of the dry hard seeds of "mung dal" is considered to indicate that some process more rapid than that of digestion may be concerned with the liberation of vitaminic substances.

IV. *The influence of a scorbutic diet on the adrenal glands* (pp. 188–194.—This paper reports the morbid anatomy and histopathology of the adrenal glands of guinea pigs under the prolonged influence of a scorbutic diet of crushed oats and autoclaved milk. Such a diet was found to cause pronounced depreciation in the functional capacity of the adrenal glands occurring before clinical evidences of scurvy manifested themselves. The changes noted in the adrenal glands were an increase in size and weight, a marked diminution in adrenalin content, hemorrhagic infiltration usually centered around the periphery of the adrenal cortex, and degenerative changes in the cellular elements of the adrenal cortex and medulla.

Food factors in gastroenterology, L. B. MENDEL (*Amer. Jour. Med. Sci., 158 (1919), No. 3, pp. 297–307*).—In this paper, read at the meeting of the American Gastroenterological Society at Atlantic City, N. J., on June 9, 1919, the author reviews and discusses recent studies of nutrition with reference to their bearing on problems of gastroenterology.

Origin of the so-called autointoxication symptoms, W. C. ALVAREZ (*Jour. Amer. Med. Assoc., 72 (1919), No. 1, pp. 8–13*).—The author reaches the conclusion that the symptoms commonly attributed to absorbed toxins are really produced mechanically by extension and irritation of the colon in constipation.

Alkaline reserve capacity of whole blood and carbohydrate mobilization as affected by hemorrhage, A. L. TATUM (*Jour. Biol. Chem., 41 (1920), No. 1, pp. 59–73*).—Determinations are reported of the blood sugar and alkaline reserve capacity of the whole blood of rabbits after hemorrhage.

"From the observations (1) that a rise in blood sugar (also plasma sugar) occurs simultaneously with a fall in alkaline reserve capacity of whole blood, (2) that alkalis administered by mouth, which enrich the portal vein blood in alkali, retard the onset of hyperglycemia, while (3) acids by the same route increase the susceptibility to hyperglycemia on hemorrhage, and further (4) that artificial enrichment of blood in sugar by injection in small quantities does not immediately produce a fall in reserve, the conclusion seems warranted that hemorrhage produces hepatic asphyxia in such a way that acids accumulate in liver cells and there promote glycogenolysis. These conditions then lay the responsibility of the rise in sugar upon the fall in alkali in cells."

This is thought to support the contentions of Murlin and Sweet (E. S. R., 36, p. 562) and of McDanell and Underhill (E. S. R., 37, p. 64) that the acid-base balance in the blood and ultimately in the body cells is an important factor determining the state of glycogenolysis as well as glycogenesis, and that the hyperglycemia of hemmorhage can be rationally explained on the basis of a disturbance in normal neutrality.

Effect of work and heat on the hydrogen-ion concentration of the sweat, G. A. TALBERT (*Amer. Jour. Physiol., 50 (1919), No. 3, pp. 433–442*).—The H-ion concentration of sweat produced by work and by heat was determined by both the colorimetric and gas-chain methods with the following general results:

Sweat caused from either work or heat was always acid, but that caused by external heat was always more acid than that caused by muscular work. Of a total of 53 observations on 4 different subjects the average pH of the sweat produced by work was 6.22 and of that produced by heat 5.73. The observations also showed that in a continued secretion of sweat the reaction does not remain entirely constant, a second sample generally showing a slight increase and a third a small but distinct diminution compared with the first sample.

"The fact that heat sweat is acid may be looked upon as a demonstration that the sweat in man under ordinary dietary conditions is normally acid, and that this secretion, like that of urine, helps to maintain the acid-base equilibrium of the organism. But why the heat sweat should exhibit a greater acidity than the work sweat is not clear. It is hoped that further study of this problem may prove not only of physiological, but of therapeutical value."

ANIMAL PRODUCTION.

The genetic and the operative evidence relating to secondary sexual characters, T. H. Morgan (*Carnegie Inst. Wash. Pub. 285 (1919), pp. 108, pls. 10*).—The author reports breeding and castration experiments with Golden Sebright bantams, reviews a number of published experiments dealing with secondary sexual characters in mammals, birds, batrachians, crustaceans, and insects, and discusses Darwin's theory of sexual selection, and other theories purporting to account for sexual dimorphism.

In crosses between Sebrights and Black-Breasted Red Game bantams, it was found that all the F_1 males were hen-feathered like the Sebright. Since reciprocal crosses gave identical results, it is concluded that the factor or factors determining hen-feathering are not sex-linked. The F_2 males consisted of 29 hen-feathered individuals (15 of them deviating somewhat toward cock-feathering) and 26 cock-feathered individuals. This is considered a 9 : 7 ratio, the author's hypothesis being that two dominant factors must cooperate to produce hen-feathering in the male fowl.

Castration was successfully accomplished in the case of several (apparently 9) Sebright cockerels, 2 F_1 cocks, and 4 F_2 hen-feathered males. With one exception all developed typical cock-feathering at the following molt. The influence was immediate, since feathers partially developed at the time of the operation were "hen" at the tip and "cock" toward the base. In certain cases castrated individuals reverted partly toward hen-feathering in the course of time, but reopening of the abdominal cavity showed regenerated testicular masses. No explanation is offered for the anomalous castrate, a pure bred Sebright, which did not develop cock-feathering; at autopsy no testicular tissue could be found.

A histological study of the Sebright testes by Boring and Morgan has been noted (E. S. R., 40, p. 665).

Sex studies.—XI, Hermaphrodite birds, A. M. Boring and R. Pearl (*Jour. Expt. Zool., 25 (1918), No. 1, pp. 1–47, figs. 41*).—Most of this paper is an account of the behavior and internal anatomy of 8 chickens showing external characters partly of one sex and partly of the other. The authors also report that 3 normal-looking hens having the mating instincts of males were normal females in every anatomical detail, and that 2 guinea fowl chicken hybrids with male external characters but of indifferent sex-behavior had male genitalia of normal appearance but the testes consisted only of stroma with no trace of tubules or germ cells.

Five of the suspected hermaphrodites were of the Drentisch breed and were secured in Holland from Houwink, a well known breeder, who attributed the hermaphroditic appearances to inbreeding, an opinion not shared by the authors. None ever laid an egg or manifested any sexual instincts. Dissection disclosed ovarian tumors in three of the birds and a pathological ovary in a fourth. The genital organs were those of females but infantile except in one case. The fifth bird was a true hermaphrodite with two gonads, a typical testis with mature spermatozoa on the right side, and on the left in the normal position an ovary without ripe oocytes but with remains of atretic follicles. On the left side was a large coiled oviduct like that of a laying hen, and on the right a much smaller oviduct and an infantile vas deferens. This bird had a large comb and large spurs, and was the most male-like in appearance of the five.

The three other birds were also true hermaphrodites, each with a single gonad, an ovotestis, on the left side. They were of diverse origin, coming from West Virginia, Maine, and Michigan, respectively. The West Virginia specimen had a small comb, large spurs, male carriage, female body shape, and female feathering, and fought both hens and cocks. In the ovarian part of the gonad were small oocytes, and in the testicular tissue spermatogonia and spermatocytes but no spermatozoa. The oviduct was infantile. The Maine specimen was a cross between a Barred Plymouth Rock and a Game. Its secondary sexual characters were at first exclusively female, but it gradually became more and more male-like. It never laid an egg. The gonad consisted mainly of testicular tissue, in which were immature or degenerate sperm. The Michigan bird was a cross between a Rhode Island Red and a Plymouth Rock, and was originally considered an abnormal hen-feathered cockerel. In the second summer it laid at least 12 eggs and then became fat and still more male-like. The ovarian tissue was normal and showed remnants of 14 corpora lutea. Active sperm were present in the testicular part.

The authors conclude that body shape and carriage give a general indication of the sex of the gonad, but that the development of comb, spurs, and wattles does not. The histological study of these gonads is held to show that the interstitial cells bear no causal relation to the secondary sexual characters, but that the amount of lutear pigment is positively correlated with somatic femaleness. The authors are also able to confirm the observations of Goodale (E. S. R., 38, p. 170) that persistent Wolffian ducts (vasa deferentia) is of normal occurrence in female fowls.

Previous studies of this series have been noted (E. S. R., 40, p. 664).

The influence of excessive sexual activity of male rabbits.—I, On the properties of the seminal discharge, O. Lloyd-Jones and F. A. Hays (*Jour. Expt. Zool., 25 (1918), No. 2, pp. 463–497*).—The authors conducted a series of experiments at the Iowa Experiment Station in which male rabbits were allowed to copulate repeatedly for upward of 20 times in rapid succession during 3-hour periods. The present paper is mainly a report of a variety of observations on the semen recovered (from the vagina) at the first, fifth, tenth, fifteenth, and twentieth services. The data cover over 60 experiments involving 4 males, but a full set of semen samples was seldom secured in any one experiment. In a number of the experiments the semen was not removed at the services indicated and the females were held to see whether pregnancy ensued and how large a litter would be produced.

At the fifteenth and particularly the twentieth services there was a noticeable decrease in (1) the amount of semen recovered, (2) the number of spermatozoa per unit weight of semen, (3) the proportion of sperm showing the initial type of normal movement, i. e., the "progressive vibratile" motion of Reynold's classification,[1] and (4) the duration of motion. The percentage of pregnancies gradually decreased from 72.1 at the first services to 35.6 at the twentieth. There was, however, no decrease in litter size until the twentieth service was reached, the successive averages (for the 5 services under observation) being 6.92, 5.95, 6.95, 6.46, and 4.53.

The influence of excessive sexual activity of male rabbits.—II, On the nature of their offspring, F. A. Hays (*Jour. Expt. Zool., 25 (1918), No. 2, pp. 571–613, figs. 22*).—The author presents charts showing the growth of the young produced in the experiments noted above.

The offspring of matings following heavy service of the males were found to be in no way inferior in size or viability to those of matings following light service. There was, however, a low proportion of males among the offspring of heavily taxed males. The numbers of males per 100 females in the young from the first, fifth, tenth, fifteenth, and twentieth services were 129, 77, 80, 53, and 28 respectively. These sex data are based on a total of 482 individuals.

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[1] Fertility and sterility, E. Reynolds. Jour. Amer. Med. Assoc., 67 (1916), No. 17, pp. 1193–1199, fig. 7.

"There is a possibility that heavy service exerts a selective action upon the sperm cells and may eliminate from fertilization the majority of the male-producing spermatozoa. The large female-producing sperm cells may show a greater rate of motility, greater endurance, or for some other cause outdistance offspring." The occurrence of these two kinds of spermatozoa in the rabbit was reported by Bachhuber (E. S. R., 35, p. 167).

The occurrence of these two kinds of spermatozoa in the rabbit has been reported by Bachhuber (E. S. R., 35, p. 167).

Degeneration in the albino rat testis due to a diet deficient in the water-soluble vitamin, with a comparison of similar degeneration in rats differently treated, and a consideration of the Sertoli tissue, E. Allen (*Anat. Rec., 16* (*1919*), *No. 2, pp. 93 117, figs. 17*).—Four male white rats were furnished to the author by Osborne and Mendel. The individuals "were chosen at random from a large group which had been subjected to a diet deficient in the water-soluble vitamin. All of these rats, both male and female, had proved sterile. Aside from their sterility they were very well developed." Histological examination of the testes revealed complete absence of spermatozoa, only a few normal germ cells at other stages of development, and a great increase in the interstitial tissue. The Sertoli cells persisted. It is pointed out that this type of degeneration resembles that produced by exposure to X-rays.

A similar degeneration of the germ cells, but without the hypertrophy of the interstitial tissue, was observed in the testes of 9 rats sent to the author by E. C. MacDowell. Five of these animals had been exposed to fumes of alcohol for long periods, and the others were untreated controls, each a brother of one of the alcoholics. In general, there was less abnormality among the controls than among the experimental animals, but the two groups overlapped. The testes of a fifth untreated control were normal; this individual's brother, although he had received alcoholic treatment longer than any of the others (155 days), was only slightly affected. These rats were some of those used in an experiment of which a preliminary report has been published.[1] The fecundity of the treated rats was reduced, but they were not entirely sterile.

Changes in the relative weights of the various parts, systems, and organs of young albino rats underfed for various periods, C. A. Stewart (*Jour. Expt. Zool., 25* (*1918*), *No. 2, pp. 301–353, fig. 1*).—The author records a large amount of data on the body development, relation of parts, and weights of internal organs of 55 underfed white rats and 35 control rats. Three groups of the former were underfed from birth and were killed at the ages of 3, 6, and 10 weeks, respectively, while in the case of a fourth group underfeeding began at weaning (3 weeks) and continued until the animals were killed 20 to 59 weeks later. Before weaning the underfeeding consisted of intermittent absence from the mother totaling about half the time, and after weaning of limited and gradually diminishing amounts of bread and milk sufficient only for maintenance and slight (unavoidable) growth. Each group of experimental animals is compared with controls killed at approximately the same body weight.

In body form the chief result of underfeeding was an elongation of the tail. The head after very long maintenance became somewhat heavier than in the controls and the trunk somewhat lighter. The legs were changed very slightly if at all. The skeleton increased in weight and developed normally to judge from a decreased water-content, the appearance of third molar teeth, and the formation and fusion of various epiphyses. The musculature also increased slightly in weight, but the integument and viscera decreased.

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[1] On the growth and fecundity of alcoholized rats, E. C. MacDowell and E. M. Vicari. Proc. Natl. Acad. Sci., 3 (1917), No. 9, pp. 577–579.

In the case of the groups underfed from birth, there was a marked increase in the weights of the spinal cord, eyeballs, liver, and alimentary canal (empty); a slight increase in the brain, heart, spleen, adrenals, kidneys, testes, epididymides, ovaries, and hypophysis; no change in the thyroid and the pineal body, and a marked loss in the thymus and lungs. Similar but more variable changes occurred in the organs of the older group.

Microscopic analysis of cattle foods, T. N. MORRIS (*Cambridge, England: Univ. Press, 1917, pp. VIII+74, figs. 55*).—This is a brief guide to the identification under the microscope of plant materials legitimately present in mixed feeding stuffs. Cereals, leguminous plants, oil-producing seeds and nuts, and cruciferous seeds are considered.

The significance of the nonprotein nitrogen content of feeding stuffs, ZUNTZ (*Landw. Vers. Sta., 91 (1918), No. 3-4, pp. 155-159*).—The author reports the nitrogen metabolism of a pig fed potato flakes. During part of the experiment the flakes fed had been washed in water and the water then expressed, a process thought to remove all the nitrogen products except pure protein.

Approximately equal amounts of crude protein were consumed whether the flakes had been washed or not, and about the same amounts were retained in one case as in the other. It is concluded, therefore, that a mixture of true protein and its decomposition products has as great a feeding value as an equal weight of pure protein alone.

Losses of organic matter in making brown and black alfalfa, C. O. SWANSON, L. E. CALL, and S. C. SALMON (*Jour. Agr. Research* [*U. S.*], *18 (1919), No. 6, pp. 299-304*).—In this paper, a contribution from the Kansas Experiment Station, the authors describe investigations of the nature and amount of loss in nutritive value of alfalfa hay stacked in a partially wilted condition and subjected to fermentations which result in a product known as brown and black alfalfa. The feeding value of this material was also compared with that of alfalfa hay. The hay was cut, wilted for a few hours, and stacked in the open. The stack was sampled the latter part of December, and three-fourths of the hay fed to steers. The remaining portion was left in the stack and sampled the last of March.

It is stated that the alfalfa underwent changes which resulted in an average loss of 39.2 per cent of the organic matter. The loss apparently increased with the length of time in the stack and with the degree of fermentative changes that occurred. Alfalfa which had become black as a result of fermentation was found to be quite inferior as a feed for steers when compared with both brown alfalfa hay and alfalfa hay of good color and quality. In the feeding test, carried on by C. W. McCampbell, with 3 lots of 14 steers each for 180 days, the average daily gain per head on the black alfalfa ration was only 1.45 lbs., as compared with 1.94 and 1.96 lbs., respectively, for the corresponding rations with brown alfalfa hay and hay of good color.

Sunflower silage, R. E. NEIDIG and L. E. VANCE (*Jour. Agr. Research* [*U. S.*], *18 (1919), No. 6, pp. 325-327*).—The authors report the proximate composition and the organic acid content of three samples of sunflower silage collected at different depths in a silo at the Idaho Experiment Station. The acids were determined by the methods employed by Neidig (E. S. R., 39, p. 878) for other silage crops. The sunflower silage resembled corn silage in composition. The best sample from the standpoint of acid fermentation contained no butyric acid, 3.79 per cent of other volatile fatty acids, and 3.45 per cent of lactic acid (dry basis).

Nitrogen metabolism of two-year-old steers, S. Bull and H. S. Grindley (*Jour. Agr. Research* [*U. S.*], *18* (*1919*), *No. 5, pp. 241–254, figs. 4*).—The authors present and discuss tables showing the amounts of nitrogen ingested and excreted weekly by eight 2-year-old steers in the course of a 37-week metabolism experiment at the Illinois Experiment Station. Three reports on other phases of this experiment have been noted (E. S. R., 32, p. 69; 37, p. 471; 39, p. 576).

Of the total increase in live weight 14.7 per cent was found to be protein. The individual steers stored from 18.9 to 25.1 per cent of the nitrogen absorbed, the average being 22.37. Although separate groups (2 steers each) were kept on different nutritive planes varying from maintenance to full feed, and the proportion of corn in the ration was increased as the experiment progressed and finally toward the end linseed meal was introduced (clover hay being the roughage throughout), the variations in treatment apparently affected neither the percentage of protein in the gain nor the percentage of absorbed nitrogen retained. Averaging all groups there was found a lower proportion of stored protein in the later stages of the experiment, but this is attributed to advancing age.

Of the 284 nitrogen balances listed only 5 were negative. Two of these are recorded for a maintenance steer, and two for a steer on full feed.

Finishing heavy steers on blue grass pasture supplemented with varying amounts of cottonseed meal, R. E. Hunt (*Virginia Sta. Rpt. 1918, pp. 47–50*).—For 145 days, beginning May 19, 1916, 4 lots of ten 1,000-lb., grade Shorthorn steers on blue grass pasture were fed, respectively, 1, 2, 3, and 4 lbs. of cottonseed meal daily per head, and in the respective lots the gains were 340, 380, 362, and 341 lbs. per steer. Twenty steers carried on pasture without supplement in the same period made a gain of 385 lbs. per head. The feeding of the supplement did not produce the expected finish early in the pasture season, the reason being that those fed the meal did not graze actively during the whole day even when the meal was given in the evening.

The utilization of calcium compounds by growing swine, E. B. Forbes, J. O. Halverson, J. A. Schulz, and E. B. Wells (*Mo. Bul. Ohio Sta.*, *4* (*1919*), *No. 11, pp. 336–340*).—This is a preliminary discussion of two experiments with swine, one carried out in November and December, 1917, the other from August to October, 1918. The pigs received a grain mixture, common salt, and the various calcium compounds that were tested, including powdered limestone, precipitated bone flour, steamed bone flour, raw rock phosphate, and commercial precipitated calcium carbonate. Details are not given, but some o the results of the second experiment have been cited elsewhere by Halverso (E. S. R., 41, p. 178).

It is concluded that the precipitated carbonates and phosphates were mor efficient mineral supplements to a strictly grain ration than the less solub rock phosphate.

Selecting, dressing, and curing pork on the farm, M. D. Helser (*Io Sta. Circ. 61* (*1919*), *pp. 3–24, figs. 27*).—This circular contains directions, wit accompanying illustrations, for selecting, dressing, and curing pork on th farm, together with specifications and a bill of materials for a fireproof hollow tile smokehouse 7 ft. square and 9 ft. high.

Report of the third (pullet) year of the Vineland international eg laying and breeding contest, R. R. Hannas (*New Jersey Stas. Hints t*

Poultrymen, 8 (1919), No. 3, pp. 4).—This is a preliminary report of the final year of a three-year egg laying contest, similar reports having been issued for the previous years (E. S. R., p. 76). The egg records of 100 pens during each of the three years are tabulated, as well as averages by breeds of production and cost records. The average production per bird was 179 eggs, or an increase of 17 eggs over the first, and 50 over the second year.

Poultry raising, C. Voitellier (*Aviculture. Paris: J. B. Baillière & Sons, 1918, 4. ed., pp. 515, figs. 238*).—This is a slightly revised edition of a well known volume (E. S. R., 17, p. 1004) in G. Wery's Encyclopédie Agricole.

DAIRY FARMING—DAIRYING.

A further study of milk substitute materials in feeding dairy calves, R. E. Caldwell (*Jour. Dairy Sci., 2 (1919), No. 4, pp. 312–329, figs. 15*).—The author tabulates and discusses the nitrogen ingested and excreted by four calves during 12 ten-day periods of a metabolism trial at the Indiana Experiment Station. One calf was a day old and the others 20 days old at the start. The experiment was largely in continuation of the work of O. H. Anderson, reported by Carr and others (E. S. R., 36, p. 567), who found a large loss of nitrogen in the feces when a calf meal containing dried blood was fed.

Two mixtures were tested as substitutes for milk, viz: (1) Linseed meal, red dog, hominy feed, and liquid beef blood, 1:1:1:4, and (2) ground corn, gluten feed, red dog, and buckwheat flour, 5:5:5:3, plus an infusion of clover hay containing 0.1 per cent nitrogen. The calves fed the substitutes received limited amounts of milk during the first four periods. All calves received either alfalfa or clover hay throughout, and a dry mash which consisted of corn and oats except with the clover juice ration, when some of the grain mixture of this ration was fed dry.

One calf received the liquid blood mixture for the first 9 periods, and consumed more nitrogen, excreted a larger proportion through the urine, and retained a smaller proportion than any of the others, but the actual amount retained was about equal to the average of the two check calves fed milk. During the remainder of the test this calf was given 1 part of dried blood in place of the 4 parts of liquid blood. The amounts of nitrogen consumed and retained remained unchanged, but the path of excretion changed from urine to feces. This calf made the most rapid growth of the four, the average daily gain being 1.15 lb.

A second calf, receiving the clover juice ration for 9 periods, consumed a small quantity of nitrogen, retained the smallest amount, and showed a high proportion of fecal nitrogen after milk feeding ceased. During the last 3 periods the liquid blood ration was given to this calf; the proportion of retained nitrogen diminished, and the urinary nitrogen increased. This calf made the least satisfactory growth, the average daily gain being 0.68 lb.

The other two calves received a milk ration for 8 and 9 periods, respectively. With only a medium consumption of nitrogen, a high proportion was retained, and a fair degree of equality was maintained between the fecal and the urinary nitrogen. Toward the end of the experiment one of these calves was changed to the liquid-blood ration and the other to the clover-juice ration. The former showed an increase in the urinary nitrogen, the latter an increase in the fecal nitrogen.

Self feeders for dairy cows, R. E. Hunt (*Virginia Sta. Rpt. 1918, pp. 50–60, figs. 2*).—An experiment in giving 2 Holstein and 2 Jersey cows in milk free choice of concentrates (corn meal, wheat bran, cottonseed meal, peanut meal, and linseed meal) for 20 weeks is reported. The grains were fed in a special self-feeder (which is described and illustrated) of the cradle type. During the first 10 weeks the cows received all the corn silage that they would eat, and during the rest of the time they were on blue-grass pasture.

This method of feeding proved very uneconomical. A pound of concentrates was consumed for every 1.47 lbs. of milk. Excluding pasture, the estimated net energy of the feed was almost 50 per cent higher than that called for by the Armsby standard for animals of similar weight and productivity, while almost twice the necessary digestible protein was consumed.

Inheritance of Jersey colors, J. J. Hooper (*Jour. Dairy Sci., 2 (1919), No. 4, pp. 290–292*).—The author states that he has tabulated the color markings, as entered in the registry books of the American Jersey Cattle Club, of 1,145 calves and their sires and dams. Allowing for faulty descriptions, he finds (1) broken body color recessive to solid color, (2) white tongue recessive to black tongue, and (3) white switch recessive to black switch. There was a marked tendency for solid colored calves to have black tongues and switches. The author also suggests that the roan color formerly rather common among Jerseys was dominant to the ordinary color.

As to tongue color, see also a previous note by Pearl (E. S. R., 31, p. 565).

Farmers' clean milk book, C. E. North (*New York: John Wiley & Sons, Inc., 1918, pp. XI+132, figs. 71*).—This volume is mostly an elementary account of the bacteriology of milk in relation to farm practices, and cites a number of specific instances where clean milk was produced without expensive equipment. The author holds that the dairyman himself is of more importance than the dairy score card.

The sampling of freshly drawn milk for cow-testing association work, R. H. Shaw and E. F. Deysher (*Jour. Dairy Sci., 2 (1919), No. 4, pp. 277–289*).—The authors, working in the Dairy Division of the U. S. Department of Agriculture, report the precentages of butter fat in a series of samples collected from 25 different milkings of Holstein and Guernsey cows. As the milk was received from the milker a 50-cc. sample was taken with a small dipper from the top of the pail and another sample withdrawn by means of a milk-thief. The milk was then poured into a shotgun can and repoured four times. After each pouring a dipper sample and a milk-thief sample were collected. It is concluded that the use of the milk-thief is an unnecessary and time consuming refinement, and that a representative sample is collected by a dipper after a single pouring.

In another experiment 4 milkings of Guernsey and 4 of Holstein milk were allowed to stand undisturbed for from 25 to 35 minutes, samples for analysis being withdrawn at frequent intervals. No increase in the fat content of the upper layer of the Holstein milk was discovered during the period of observation, but in the case of 3 of the Guernsey milkings from 3 to 5 minutes sufficed for a recognizable increase.

Data are also cited from 46 daily milk records to show that the error introduced into the daily fat precentages by taking equal instead of aliquot parts of the morning's and evening's milk is in most cases well within the error of calibration of the Babcock test bottles.

The comparative value of quantitative and qualitative bacteriological methods as applied to milk, with special consideration of the methylene blue reduction test, E. G. Hastings (*Jour. Dairy Sci., 2 (1919), No. 4, pp. 293–311*).—The author discusses the relative accuracy and fields of usefulness of the standard plate culture method, the method of direct microscopic examination, the little plate method of Frost (E. S. R., 36, p. 574), and the methylene blue reduction test for determining the number of bacteria in milk.

The reduction test is held to possess unique advantages for use in milk control work in small communities and for purposes of rapid survey. "The approximate bacterial content of 200 samples can easily be determined in 10 to 12 hours. . . . A water bath, some means of heating it to the desired temperature, pipettes, and test tubes make up the apparatus needed, and an aqueous solution of methylene blue the only reagent."

Five applications of the methylene blue reduction test to samples of milk whose bacterial content had been varied by the addition of different amounts of the same inoculum are reported. In all cases the reduction time was inversely proportional to the amount of inoculum added, whereas the acidity developed was not. This experimental procedure is considered the most reliable one available, and the author protests against the common assumption that the plate culture method should be taken as the basis of comparison in estimating the reliability of a bacteriological test.

The experiments reported were made at the Wisconsin Experiment Station.

What is condensery milk worth? A. C. ANDERSON (*Jour. Dairy Sci., 2* (*1919*), *No. 3, pp. 149–158*).—The author presents itemized schedules of the costs from April, 1915, to September, 1917, of manufacturing and selling a case of sweetened condensed milk, based upon the data of Hunziker (E. S. R., 40, p. 283) appropriately modified to allow for increasing expenses, and gives by months the jobbing prices received by a particular factory during this period, the prices which it paid farmers for fluid milk, and the prices which it could have paid and still have made a profit of 10 per cent on all expenditures.

For the first 8 months the jobbing price was $5.65 for a case of 48 cans (requiring 116 lbs. of milk). The company could have paid $2.15 per hundredweight for milk during this time, but the price actually paid for milk testing 3.5 per cent varied from $1.07 to $1.62. The case price was $5.90 from December, 1915, to April, 1916, and $6 from May to September. In March the spring drop in whole milk prices began, a minimum of $1.21 per hundredweight being reached in June. By September the price had returned to $1.46. During the 10 months the buying price averaged about 41 cts. below the "possible" price. On November 1, the case price was raised to $6.75, but on a winter schedule of over $2 the buying prices for 4 months averaged only about 19 cts. per hundredweight below the "possible" price. In March, 1917, the case price was advanced 50 cts. and the whole milk price reduced 13 cts. In May, 1917, the case price was raised to $8, the top point, and the milk reached its lowest price of the year, $1.70. The cost figures show that a price of $3.04 for milk at this time would have netted a 10 per cent profit. From June to September the case price was $7.50. A price of $2.64 per hundredweight could have been paid, but the actual buying price varied from $1.75 to $2.40.

"In reviewing the facts it is evident that the selling price of the case of manufactured goods was not used as a controlling factor in determining the prices to be paid to producers."

Thirteenth annual conference of the American Dairy Science Association (*Jour. Dairy Sci., 2* (*1919*), *No. 4, pp. 259–276*).—These pages report the proceedings of a meeting held at Columbus, Ohio, on October 14, 1918. The following committee reports are published: Statistics and Marketing of Dairy Products, presented by R. C. Potts; Methods of Conducting Dairy Cattle Judging Contest, by H. Rabild; and Legal Standards for Butter, by M. Mortensen. The last named committee recommended that unsalted butter be defined as butter containing less than 0.7 per cent salt, and that the butter fat minimum for unsalted butter be 82.5 per cent and for salted butter 80 per cent. After discussion the report was received, but not formally adopted. A discussion led by F. W. Bouska on the difficulties encountered in testing buttermilk for fat is also reported.

The proceedings of the twelfth conference have been noted (E. S. R., 40, p. 476).

VETERINARY MEDICINE.

A text-book of general bacteriology, E. O. Jordan (*Philadelphia and London: W. B. Saunders Co., 1919, 6. ed., rev., pp. 691, pls. 2, figs. 177*).—This is the sixth edition of the volume previously noted (E. S. R., 36, p. 130). Certain chapters have been extensively revised and several new sections have been added, including brief descriptions of infectious jaundice, rat bite fever, and trench fever.

Live stock sanitary laws of Montana; also rules and regulations and orders of the Montana Live Stock Sanitary Board (*Live Stock Sanit. Laws Mont., 1 (1919), No. 1, pp. 160*).—A compilation of the laws, rules, regulations, and orders.

A serious forage poison, J. A. Elliott (*Farm and Ranch, 39 (1920), No. 6, p. 16, fig. 1*).—A species of ergot (*Claviceps paspali* or *C. rolfsii*) which occurs on a common forage grass (*Paspalum læve*), is said to have been very prevalent in Arkansas during 1919.

Some factors influencing the final hydrogen-ion concentration in bacterial cultures with special reference to streptococci, H. Jones (*Jour. Infect. Diseases, 26 (1920), No. 2, pp. 160–164*).—With the use of the hydrogen electrode previously noted (E. S. R., 41, p. 503), the author has studied the effect of certain factors upon the final H-ion concentration in cultures of a hemolytic streptococcus of a virulent type.

It was first determined that successive transfers of the same organism in the same medium, incubated under the same conditions, developed practically identical H-ion concentrations. The H-ion concentration was, however, found to vary with the buffer content of the medium, the percentage of glucose, the kind of utilizable carbohydrate, and the presence of ascitic fluid.

"From the results it is seen that, to obtain any accurate information regarding the final H-ion concentration of an organism, a number of factors should be taken into consideration. This characteristic, the limiting H-ion concentration of a given organism, to have any significance or subsequent application should be defined in terms of the composition of the medium, the initial reaction, and any other conditions which favor or hinder abundant growth of that organism."

Presence of specific substances in the leucocytes of immunized animals, A. Bachmann (*Compt. Rend. Soc. Biol. [Paris], 82 (1919), No. 25, pp. 1031–1033*).—The author states that he has been able to demonstrate the presence in leucocytes of immune animals of products more stable than endolysins and to which the leucocytes owe their specific immunizing properties.

Some factors influencing the potency of concentrated antitoxic serum, C. R. Hixson (*Jour. Infect. Diseases, 26 (1920), No. 2, pp. 130–147, fig. 1*).—This paper reports the results of an investigation of heat upon the antitoxic content of the globulin fraction of serum. The method used for concentrating the serums was the Banzhaf method as modified by Heinemann (E. S. R., 36, p. 179), except that different portions of the plasma ammonium sulphate mixture were heated to 60, 64, 68, and 72° C., respectively. The potency was determined of these different samples of plasma, and also of the dialyzed products of the four heatings fractionated at 38 per cent and 50 per cent saturation with ammonium sulphate. Both tetanus and diphtheria serums were used.

It was found that the percentage precipitation of proteins from heated plasma containing 30 per cent of ammonium sulphate was increased as the temperature applied was increased, and was not complete at 76°. With the increased elimination of protein an increased percentage of antitoxin was also precipitated, but the percentage loss of antitoxin was less than the percentage loss of protein. With increased temperature a transfer of antitoxin from the insoluble protein to the more soluble fraction occurred. Although this was greatest at 64°, the total quantity of antitoxin lost by increase of temperature was found to be so great as to render heating higher than 60° prohibitive from a commercial point of view.

In the fractioned serums of both diphtheria and tetanus, the 50 per cent fractions contained more units per gram protein than the 38 per cent or the unfractioned serums. As the temperature increased the 50 per cent fractions of the tetanus serums showed a greater proportionate increase in units per gram protein over the unfractioned serums than did the 50 per cent fractions of the diphtheria serums. This is explained from the fact that the tetanus plasma had aged for a much longer period than the diphtheria plasma, resulting in a greater alteration in the proteins. In general, with the application of increasingly greater amounts of heat the ratio of solids of the more soluble to those of the less soluble fractions of the pseudoglobulin was not materially changed, but the potency of both fractions of the pseudoglobulins was increased. The more soluble portion of the pseudoglobulin fraction was proportionately richer in antitoxin than the less soluble portion, and as the temperature applied reached a point near the complete precipitation of the globulins the character of the end product obtained was that of the more soluble fraction of the pseudoglobulin.

The report includes a discussion of the factors determining the color of concentrated serums.

The specific action of the euglobulin of vaccinal serum, M. Henseval (*Compt. Rend. Soc. Biol.* [*Paris*], *82* (*1919*), *No. 25, pp. 1071–1073*).—Experiments are reported which are thought to establish clearly that the euglobulin of vaccinal serum possesses a specific immunizing power which is as marked in the state of suspension as in solution, indicating that its action upon the virus is a phenomenon of adsorption.

Concerning the mode of action of vaccinal euglobulin.—The adsorption of virus by normal euglobulin, M. Henseval (*Compt. Rend. Soc. Biol.* [*Paris*], *82* (*1919*), *No. 25, pp. 1074–1076*).—Continuing the study of the euglobulin of vaccinal serums noted above, evidence is furnished that the euglobulin of normal serum has the power of adsorbing virus. The author concludes that, if this theory is applicable to vaccinal serum, vaccination must have for its effect the reinforcement of the adsorbing power of proteins so that complexes with the virus are formed which can no longer be dissociated.

The influence of normal beef serum on the anthrax bacillus, J. A. Kolmer, D. C. Wanner, and M. E. Koehler (*Jour. Infect. Diseases, 26* (*1920*), *No. 2, pp. 148–159*).—The influence of normal beef serum upon the anthrax bacillus was studied in vivo by an investigation of its protective and curative properties in anthrax infection in rabbits and mice, and in vitro by bactericidal, agglutinating, and complement binding tests. As rabbits were found highly immune and white mice highly susceptible to the culture of anthrax bacilli used in the investigation, the serum of these animals was included in the study for purposes of comparison with beef serum.

Fresh, sterile, normal beef serum was found to be but feebly toxic for white mice when injected intraperitoneally, doses equivalent to 10 cc. per 100 gm. of body weight being well borne. Protection tests consisting in the intraperitoneal injection of mice with heated and unheated normal beef serum in doses ranging from 1 to 10 cc. per 100 gm. generally failed to protect the animals against one to five minimal lethal doses of a culture of anthrax bacilli. Rabbits proved to be unsuitable for protection tests owing to their high degree of natural immunity.

Unheated normal beef serum and rabbit blood were both bactericidal for the anthrax bacillus, heated beef serum somewhat less bactericidal, and mouse blood without appreciable effect. Normal beef serum contained variable amounts, and rabbit and mouse serum small amounts of agglutinin for anthrax bacilli. Heated serums contained less agglutinin. Normal beef, rabbit, and mouse serums did not contain complement fixing substances for antigens of anthrax bacilli.

"At best it would appear on the basis of these experiments that normal beef serum, as secured from animals under ordinary conditions, is but feebly protective or curative for anthrax, and while its administration as described by Penna and his associates [E. S. R., 40, p. 582] may favorably influence the pustule it is doubtful if the serum is sufficiently powerful to influence anthrax bacteremia."

Blackleg immunization, A. Eichhorn (*Rpt. U. S. Live Stock Sanit. Assoc., 22 (1918), pp. 102–112*).—This paper, presented at the annual meeting of the U. S. Live Stock Sanitary Association held in Chicago in December, 1918, summarizes the present-day knowledge concerning the nature of blackleg and the relative value of the different products which have been developed as immunizing agents.

Deer-fly fever or Pahvent Valley plague, E. Francis (*Pub. Health Rpts. [U. S.], 34 (1919), No. 37, pp. 2061, 2062*).—This relates to an affection, an investigation of which by the author was commenced in July, 1919, that during recent years has occurred among the rural population of Millard County, Utah. The disease is thought to be initiated by fly bite on some exposed surface of the body, and is manifested by the enlargements of the lymph glands which drain the bitten area and by a fever of a septic type lasting from three to six weeks. The site of the bite and affected lymph glands become tender and inflamed, and they commonly suppurate. There is marked prostration, and the patient is confined to his bed. Probably 24 cases occurred in Millard County in each of the years 1917, 1918, and 1919. The first case known to terminate fatally was reported in 1919.

Guinea pigs and rabbits were inoculated, a first series with blood from a patient suffering from the affection and a second series with pus obtained from a suppurating cervical gland of the patient. Both series of animals developed a disease which proved fatal in a few days. At post-mortem these cases exhibited caseation of the lymph glands and small necrotic foci throughout the liver and spleen. Cultures made on ordinary laboratory media from the lesions of the animals dying from the disease were negative, but cultures made upon coagulated egg yolk yielded a growth of small nonmotile coccobacilli. These cultures reproduced the lesions of the disease in guinea pigs.

The lesions found by the author in the experimental animals used in this investigation were apparently those of the plague-like disease found in ground squirrels in California, as described by McCoy in 1911 (E. S. R., 25, p. 249). The organism causing the affection was described by McCoy and Chapin in 1912 as *Bacterium tularense* (E. S. R., 26, p. 461), and an infection of man with it was described by Wherry and Lamb in 1914 (E. S. R., 33, p. 450).

The retest of reacting cattle, J. G. Wills (*Rpt. U. S. Live Stock Sanit. Assoc., 22 (1918), pp. 53–84, figs. 6*).—In this paper, presented at the annual meeting of the U. S. Live Stock Sanitary Association held in Chicago in December, 1918, data are presented concerning the retesting of known reactors to tuberculin. A total of 35 cattle were retested 6 consecutive times, and 33 cattle 5 consecutive times, at irregular intervals. Intradermal-ophthalmic and intradermal tests were used in some cases as well as the subcutaneous test.

In considering the results obtained, attention is called particularly to the fact that at least one negative test was recorded for each of the 68 animals, although with one exception all upon slaughter showed distinct tubercular lesions. From this the author concludes that "any bovine animal showing a distinct and typical reaction to tuberculin should thereafter be considered as tuberculous and treated accordingly. In our opinion these experiments have shown conclusively that the retest of typical reacting animals is unnecessary and misleading, because such retests can not be relied upon. The fact that 25 per cent of the reactors shown on these records were found generalized on slaughter, although passing a satisfactory test within a few days previous, would seem to justify this statement."

The investigation also showed that the continual use of tuberculin even in excessive doses apparently has no harmful effects on bovines, but has a tendency to cause encapsulation of tubercular lesions in infected animals and a resistance to the further action of tuberculin.

The results obtained with the various test methods were so contradictory that the author claims no special advantages for any one method. The importance is emphasized "of so caring for cattle while under test as to avoid irregular and fluctuating temperatures due to injudicious feeding or watering, excitement, or other disturbing influences. The accurate interpretations of the results of the subcutaneous test are largely dependent upon the proper control and supervision of the animal during the examination."

Progress in tuberculosis control, J. A. KIERNAN (*Amer. Jour. Vet. Med.*, *15* (*1920*), *No. 1*, *pp. 1–7*).—A paper read at the twenty-third annual meeting of the U. S. Live Stock Sanitary Association, held at Chicago, December 1–3, 1919.

The midland cattle disease (*Agr. and Stock Dept. Tasmania, Bul. 84* (*1919*), *pp. 16, figs. 5*).—This bulletin contains a preliminary report by A. Theiler on the cause of gal-lamziekte, based upon investigations in South Africa which are said to have definitely determined the cause of the disease.

"The cause of gal-lamzietke, a disease of the muscular system of cattle indicated by degenerative processes, is a combination of two conditions. The disease and death is produced by the eating of bones in a putrefactive stage and probably other material, such as dry rotten flesh and substances that have been in contact with rotten flesh, which contain a poison of probably a ptomaine nature and bacterial origin that is produced under certain climatic conditions (moisture and subsequent heat) and thus is not always present. . . . The disease has experimentally been produced in cows that were picked on account of abnormal craving; they voluntarily and greedily ate the bones and contracted typical lamziekte. There is no difficulty to understand this when it is realized that as little as 4 oz. of putrefied bones are required to produce the disease when drenched. There could be no doubt that the disease was lamziekte. The microscopical lesions found in the muscles of these cattle are identical with those found in cattle that contracted the disease naturally."

This is followed by the minutes of a meeting held to discuss the question of the further investigation of the disease. The bulletin concludes with an account by A. Theiler of the different clinical forms of the disease, namely, per-acute, acute, subacute, and the stijfziekte form.

Prevention of hog cholera, C. N. HACKETT (*Cornell Vet.*, *9* (*1919*), *No. 4*, *pp. 181–190*).—This paper, presented at a meeting of the Minnesota State

Veterinary Medical Association in July, 1919, consists of a general discussion of the essentials in the treatment and prevention of hog cholera.

Three new bacterial species pathogenic for the domestic birds, [P. B. HADLEY] (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 5 (1919), No. 9, pp. 67–69*).—During the course of studies of the etiology of typhoid-like diseases of birds made at the Rhode Island Experiment Station, a bulletin relating to which has been previously noted (E. S. R., 40, p. 685), the author met with three bacterial species which differ in important respects from the causative agent of fowl typhoid (*B. gallinarum*), from the causative agent of fowl cholera (*B. avisepticus*), and from all other at present recognized bacterial types. They are described under the names *Bacterium jeffersonii*, *B. rettgerei*, and *B. pfaffi* n. spp. *B. jeffersoni* is considered undoubtedly a new paratyphoid form, while *B. rettgerei* and *B. pfaffi* are not related to any organisms hitherto described.

During the course of an epidemic among poultry in a southern Massachusetts town in 1909, in which *B. jeffersonii* was isolated, about 4,000 birds died at a single plant, causing a total loss of about $10,000 in stock and trade. The organism is described as a short (0.6 to 0.8 μ), Gram-negative, nonmotile, nonliquefying rod, which stains with the ordinary stains but does not manifest either bipolar or peripheral staining characteristics. In agglutinating tests only a slight antigenic relation is manifested with strains of *B. gallinarum* and none with *B. avisepticus*.

B. rettgerei was isolated by Rettger from a fowl-cholera-like epidemic occurring in a flock of hens in Connecticut in 1909. It proved to be a short (0.5 to 0.8 μ) Gram-negative, nonmotile, nonliquefying rod, and does not show either peripheral or bipolar staining.

B. pfaffi is said to have been obtained in 1914 from Kral's Laboratory in Vienna, having been isolated by Pfaff in 1905 from a canary epidemic. It is medium-sized (1.2 to 1.4 μ), Gram-negative, nonmotile, nonliquefying rod, manifesting neither peripheral nor bipolar staining.

RURAL ENGINEERING.

The civil engineer's pocket-book, J. C. TRAUTWINE (*Philadelphia: Trautwine Co., 1919, pp. 1528, illus.*).—This is the twentieth edition, revised, of this standard handbook, which contains data on almost every subject relating to civil engineering. This edition contains 1,464 pages of data in addition to an extensive index, indicating a growth of approximately 41 per cent during the past 10 years.

Sixth biennial report of the Department of Engineering of the State of California (*Bien. Rpt. Dept. Engin. Cal., 6 (1916–1918), pp. 109+93+4, pls. 36, figs. 5*).—This report describes the activities of the California State Department of Engineering for the biennium ended November 30, 1918, and includes reports on cooperative investigations on water resources with the U. S. Geological Survey, and cooperative irrigation investigations with the Division of Irrigation Investigations of the Bureau of Public Roads, U. S. Department of Agriculture.

Nineteenth biennial report of the State Engineer to the Governor of Colorado, 1917–18, A. J. MCCUNE (*Bien. Rpt. State Engin. Colo., 19 (1917–18), pp. 320, fig. 1*).—This report deals with the activities and expenditures of the Colorado State Engineer's Office for the years 1917 and 1918, and includes a special report on Drainage in Colorado, by D. G. Miller of the U. S. Department of Agriculture, and reports from different irrigation districts of the State.

Annual report of the Reclamation Service, 1917–18, A. P. Davis (*Ann. Rpt. Reclamation Serv.* [*U. S.*], *17* (*1918*), *pp. 549, fig. 1*).—This report covers the expenditures and the work completed and in progress during the fiscal year ended June 30, 1918.

Fourth biennial report of the Reclamation Board of California (*Bien. Rpt. Reclam. Bd. Cal., 4* (*1917–18*), *pp. 41+XII, pls. 12*).—This is a report on the progress and status of flood control plans and works within the Sacramento and San Joaquin drainage district and a résumé of the activities and accomplishment of the board for the biennium ended December 31, 1918.

Contract forms and specifications, A. E. Morgan and C. H. Paul (*Miami* [*Ohio*] *Conserv. Dist., Tech. Rpts., pt. 6* (*1918*), *pp. 192, pls. 3*).—These forms and specifications are for the dams and channel improvements of the flood protection works being executed by the Miami conservancy district, and include 139 representative selections of plans made preparatory to letting contracts.

Graphical method for estimating storm-water run-off, R. W. Horner (*Engin. News-Rec., 83* (*1919*), *No. 6, p. 282, fig. 1*).—A diagram is given for quickly estimating storm-water run-off which is based on the formula $Q=ciA$, in which Q=the total run-off in cubic feet per second, c=the run-off coefficient of the area, i=the intensity of rainfall in cubic feet per second per acre, and A=the drainage area in acres.

Three major power possibilities in California, F. H. Fowler (*Jour. Electricity, 41* (*1918*), *No. 1, pp. 12–18, figs. 12*).—This is a summary of the water-power situation as a whole in the western United States, with particular reference to the Pit River, Feather River, and Big Creek projects in California.

Power possibilities in California, F. H. Fowler (*Jour. Electricity, 41* (*1918*), *No. 9, pp. 393–395, figs. 2*).—This is a report on a survey of the power possibilities of the streams of California.

Undeveloped water power in the Southwest, F. H. Fowler (*Jour. Electricity, 41* (*1918*), *No. 6, pp. 246–248, figs. 3*).—This is a review of power development possibilities in New Mexico and Arizona.

Irrigation engineering, A. P. Davis and H. M. Wilson (*New York: John Wiley & Sons, Inc., 1919, 7. ed., rev. and enl., pp. XXIII+640, figs. 248, pl. 1*).—This is the seventh edition of an old standard work which has been revised and rewritten to include recent developments in irrigation engineering, particularly those due to the activities of the U. S. Reclamation Service, the Irrigation Investigations Division of the Bureau of Public Roads, U. S. Department of Agriculture, and the State agricultural experiment stations. The subject of irrigation engineering is covered as completely as possible, and the following chapters are included in their order: Soils, soil moisture, plant food, water supply, evaporation, pumping for irrigation, irrigable lands, application of water to the land, duty of water, measurement of irrigation water, drainage, canals and laterals, canal structures, storage reservoirs, sedimentation of reservoirs, dams, masonry dams, water rights, operation and maintenance, investigation of a project, specifications for construction, and tables.

Irrigation district laws of Oregon, 1919 (*Salem, Oreg.: State Water Bd., 1919, pp. 34*).—The texts of the laws are given.

Irrigation, E. F. Drake and F. H. Peters (*Dept. Int. Canada, Irrig. Branch, Rpt. Irrig. Surveys and Insp., 1917–18, pp. 47, pl. 1*).—This is a combined report of the Superintendent and Commissioner of Irrigation of Canada for the year 1917–18.

Administration report of the Irrigation Branch, 1917–18 (*Admin. Rpt. Irrig. Branch* [*Cent. Prov. and Berar, India*], *1917–18, pp.* [*II*]*+90, pls. 3*).—This is a report of the work and expenditures on irrigation of the Irrigation Branch of the Public Works Department of the Central Provinces and Berar for the year 1917–18.

Factors determining the duty of water in irrigation, H. F. ROBINSON (*Engin. News-Rec., 83 (1919), No. 8, p. 355, fig. 1*).—These factors are presented diagrammatically.

Most recent developments in the methods of measuring irrigation water to farms and irrigators, F. E. TRASK (*Munic. and County Engin., 57 (1919), No. 3, pp. 142, 143, figs. 3*).—The author advocates the metering of irrigation water to farmers, and describes a meter which he has found to be satisfactory for this purpose. This consists essentially of a calibrated throat in which is suspended a propeller wheel connecting directly by rod to a gear train having a dial from which may be read directly the volume of water either in acre-feet or cubic feet.

The saving of irrigation water in wheat growing, A. and G. L. C. HOWARD (*Fruit Expt. Sta. Quetta [India] Bul. 4 (1919), pp. [III]+22, pl. 1, fig. 1*).—This is the second revised edition of this bulletin (E. S. R., 36, p. 385), in which results obtained since the publication of the first edition in 1915 are included. The work was extended to the Punjab and has also been taken up in Sind and in the United Provinces. It has been proved by actual experience that the principles governing the use of irrigation water as established at Quetta apply to the conditions of northwest India, and also that at a comparatively early stage on certain soils any further addition of irrigation water not only produces no result but actually depresses the yield.

The irrigation of the Konia plain, R. I. MONEY (*Geogr. Jour., 54 (1919), No. 5, pp. 298–303, pls. 2, fig. 1*).—The general features of this irrigation system are described.

Pumping machinery, A. M. GREENE, JR. (*New York: John Wiley & Sons, Inc., 1919, 2. ed., rev., pp. VIII+703, figs. 489, pls. 6*).—This is a treatise on the history, design, construction, and operation of various forms of pumps. The first two chapters are devoted to the history of the development of pumping machinery. These are followed by descriptive chapters on modern pumps. The remaining chapters deal with design, construction, operation, and testing.

Hexagonal chart for finding velocity of water in pipes, C. W. ANTHONY (*Engin. News-Rec., 83 (1919), No. 4, p. 169, fig. 1*).—This single diagram embraces six variable quantities, including velocity of flow, coefficient of roughness, hydraulic mean radius and slope, together with the exponents of the last two quantities.

Diagrams for excess loss of head in pipe lines, F. S. BAILEY (*Engin. News-Rec., 83 (1919), No. 4, pp. 162, 163, figs. 2*).—Diagrams are given for the purpose of quickly finding losses of head due to 90° bends of various radii, and also the losses of head which occur at increasers, reducers, gate valves, or branches in a pipe line.

Flow of water through one and one-half inch pipe and valves, F. W. GREVE, JR. (*Purdue Univ., Pubs. Engin. Depts., 2 (1918), No. 2, pp. 21, pls. 6, figs. 10*).—This bulletin reports the results of 270 experiments on the losses of head in $1\frac{1}{2}$-in. straight black water pipe and valves.

It was found that the relation of loss of head to discharge in all such cases can be represented by the general equation $H_l = MQ^n$, in which H_l = loss of head in feet of water, M and n are factors varying with the restriction of area to flow through the valves, decreasing with increase in values of the ratio of the rise of disc to the nominal diameter of the pipe, and Q = discharge in cubic feet per second.

It was also found that the coefficients for the Weisbach formula for average values for small gate valves gave values of H_l that are too small, that a gate valve causes less loss of head than a globe valve, and that the losses are nearly equal for a ratio of rise of disc to nominal diameter of pipe of 0.23.

Diagram for computing band spacing for wood-stave pipe, W. T. BARCHELLER (*Engin. News-Rec.*, 83 (*1919*), *No. 10, p. 472, fig. 1*).—A diagram is given for pipe, 1 to 20 ft. in diameter, under heads of from 10 to 200 ft., and for band diameters of from ⅜ to 1¼ in., together with a mathematical analysis of band design.

Leakage test of wood-stave pipe-line, V. M. CROWN (*Engin. News-Rec.*, 83 (*1919*), *No. 6, p. 264, figs. 2*).—The methods employed and the data obtained in a leakage test of a 30-in. continuous wood-stave pipe are reported.

Water was obtained from a 20-in. cast-iron main paralleling the wood-stave pipe. A length of 21,300 ft. was closed off by gate valves. Water was supplied and measured by three disk meters arranged in parallel. Simultaneous readings were taken of the meters and pressure gauge on four successive days at intervals of one hour. By constant repair during the test the leakage was reduced from 1,070 to 568 gal. per inch-mile per 24 hours.

Creosoted wood-stave pipe and its effect upon water for domestic and irrigation uses (*Univ. Wash., Bur. Indus. Research Bul. 1* (*1917*), *pp. 19, figs. 8*).—Experiments on the effect of creosoted wood-stave pipe on the potability of water and its usefulness for irrigation purposes are reported.

A 56-inch creosoted wood-stave pipe-line was used in the experiments. It was found that after the experimental pipe-line had been in service for 13 days, no taste of creosote could be detected in a sample of the water diluted with two parts of ordinary city water. After 29 days, no taste of creosote could be detected in undiluted water flowing through it.

With reference to irrigation waters, it was found that "the amount of creosote that diffuses into water in ordinary creosoted pipes does not have an appreciable injurious effect upon plants either in the time of germination, the percentage of germination, the rapidity of growth or the general vigor of the plant."

The farm water supply and sewage disposal, W. H DAY, R. R. GRAHAM, D. H. JONES, and H. L. FULMER (*Ontario Dept. Agr. Bul. 267* (*1918*), *pp. 80, figs. 66*).—This is a rather extensive popular bulletin dealing with the mechanics, hydraulics, chemistry, and biology of farm water supply and sewage disposal systems, with special reference to conditions in Ontario.

A disposal station for a can privy system, E. B. JOHNSON (*Pub. Health Rpts.* [*U. S.*], *34* (*1919*), *No. 22, pp. 1187–1192, pls. 2, fig. 1*).—The system is described and illustrated.

Drainage laws of the State of Illinois, in force July 1, 1917, compiled by L. L. EMMERSON (*Springfield: State, 1917, pp. 184*).—The text of the laws is given.

Drainage district laws of Oregon, 1919 (*Salem, Oreg.: State Water Bd., 1919, pp. 34*).—The texts of the laws are given.

Drainage in Michigan, D. G. MILLER and P. T. SIMONS (*Mich. Geol. and Biol. Survey Pub. 28, Geol. Ser. 23* (*1918*), *pp. 133, pls. 13, figs. 5*).—This is a report of a survey of the drainage situation in Michigan made in cooperation with the Drainage Investigations Division, Bureau of Public Roads, U. S. Department of Agriculture. The surface topography of the southern peninsula varies from level to hilly, and of the northern peninsula from level to mountainous. It is estimated that in the southern peninsula there are 2,836,000 acres of reclaimable wet lands, included in 68 counties, and that in the northern peninsula there are 2,598,000 acres of reclaimable wet lands, included in 15 counties.

With reference to soils, it is stated that the southern peninsula consists of 11.6 per cent swamp and lake, 55.2 per cent clayey and sandy till, and 33.2 per cent sand and gravel. The northern peninsula consists of 25 per cent swamp and lakes, 49.02 per cent clayey and sandy till, 17.5 per cent sand and gravel, and 8 per cent rocky knobs and ridges.

Data on the present and future needs of the State for drainage are discussed, together with the relations of drainage to other problems. The text of the Michigan drainage law and abstracts of the drainage laws of other States having drainage problems similar to those of Michigan are given, together with recommendations for an improvement in the general drainage situation in the State.

Farm drainage, F. F. Shafer (*W. Va. Agr. Col. Ext. Circ. 246 (1919), pp. 33, figs. 16*).—This deals with the general features of the planning and construction of tile-drainage systems in West Virginia.

It is estimated that there are approximately 195,000 acres in West Virginia which can be improved by drainage. "Of this amount, probably 10,000 acres or over are permanently swampy; 10,000 acres swampy at times; 85,000 or 90,000 acres periodically wet or overflowed; and 85,000 or 90,000 acres so wet at times that good crops can not be successfully grown."

Various benefits from tile drainage, F. E. Bear (*Mo. Bul. Ohio Sta., 4 (1919), No. 10, pp. 313–317, figs. 4*).—This is a summary of the benefits of tile drainage which have been established by studies at different State experiment stations, particularly the Ohio Station. It is pointed out that, in Ohio especially, tile drainage remedies alkali spots, grayish-white unproductive areas, and rawness of subsoils; decreases acidity; compensates losses by leaching; and increases yields.

Deep subsoiling of orchards in the Lindsay district, Tulare County, F. R. Brann (*Mo. Bul. Dept. Agr. Cal., 8 (1919), No. 9, pp. 537–540, figs. 4*).—Work with a giant subsoiler tool weighing 2½ tons with a submerging blade 5 ft. long is reviewed. The conclusion is drawn that deep subsoiling will prove to be a necessary treatment for practically all orchards in this region in order to permit of proper development.

Excavation: Machinery, methods, and costs, A. B. McDaniel (*New York: McGraw-Hill Book Co., Inc., 1919, pp. XIX+543, figs. 209*).—This book is divided into two sections. One section deals with a description of the construction, methods, and typical cost of operation of different types of excavating machines. The second section embodies a comparative study of the efficient and economic use of the different types of machines in the various fields of construction work.

The first section is divided into two parts. Part I deals with scrapers, graders, and shovels, including chapters on tools for loosening and hand excavation, drag and wheel scrapers, blade or road graders, elevating graders, capstan plows, and power shovels. Part II deals with dredges, and contains chapters on scraper excavators, templet excavators, trench excavators, wheel excavators, cableways, dipper dredges, ladder dredges, hydraulic dredges, subaqueous rock drills, and car and wagon loaders.

The second section contains chapters on highway construction; railroad construction; reclamation work; rivers, harbors, and canals; municipal improvements; quarries, open-cut mines, gravel pits, and brickyards; and tunnels and underground mines.

Highway laws, revision of 1918 (*Hartford, Conn.: State Highway Dept., 1918, pp. 46*).—The text of the law is given.

Highway laws: Amendments of 1919 (*Hartford, Conn.: State Highway Dept., 1919, pp. 31*).—The text of the laws is given.

Laws relating to highways and bridges, compiled by W. C. MARKHAM (*Topeka: Kans. Highway Comm., 1918, pp. 166*).—The text of the laws is given, including all laws of the State that affect road and bridge work.

Supplemental laws relating to highways and bridges (*Topeka: Kans. Highway Comm., 1919, pp. 72*).—The text is given of these laws, which are supplemental to the compilation made in 1918, as noted above. The rules and regulations governing the enforcement of the Federal Aid Act are also given.

Important statutes relating to State Highway Department of the State of Oregon (*Salem, Oreg.: State Highway Dept., 1919, pp. 80*).—This is a compilation of texts of different highway laws of Oregon.

County road legislation, W. A. MCLEAN (*Dept. Pub. Highways Ont., County Road Leg., 1919, pp. 25*).—The text of this legislation is given, including the Highway Improvement Act and provisions of the Ontario Highways Act relating to County Roads.

First annual report of the Highway Department of Georgia, T. E. PATTERSON (*Ann. Rpt. Highway Dept. Ga., 1 (1919), pp. 69, pls. 12, fig. 1*).—This is a report of the work and expenditures of the Georgia Highway Department for the period ended June 15, 1919.

Report of the State Highway Commission, 1918, H. C. BEARD (*Iowa State Highway Com., Ann. Rpt., 5 (1918), pp. 346, pls. 9, figs. 7*).—This is a report of the work and expenditures of the Iowa Highway Commission for the year ended December 1, 1918.

Twenty-sixth annual report of the Massachusetts Highway Commission for the fiscal year ending November 30, 1918, W. D. SOHIER, F. D. KEMP, and J. W. SYNAN (*Ann. Rpt. Mass. Highway Comm., 26 (1919), pp. 186, pls. 5*).—This is a report of the work and expenditures of the Massachusetts Highway Commission for the fiscal year ended November 30, 1918.

Eleventh and twelfth annual reports of the board of county road commissioners of Wayne County, Mich., 1916–17 and 1917–18, E. N. HINES ET AL. (*Ann. Rpt. Bd. Road Commrs. Wayne Co., Mich., 11 (1917), pp. 80, pl. 1, figs. 59; 12 (1918), pp. 80, pl. 1, figs. 79*).—These reports deal respectively with the activities and expenditures of the board of county road commissioners of Wayne County, Mich., for the years ended September 30, 1917, and 1918. Each includes considerable engineering data relating to the design and construction of concrete roads as practiced in the county.

Gasoline consumption tests demonstrate value of hard, smooth-surfaced roads, A. N. JOHNSON (*Engin. News-Rec., 81 (1918), No. 19, pp. 843–850, figs. 8*).—Tests on earth, gravel, bituminous macadam, brick, and concrete roads, using five 2-ton trucks to determine the relative amount of gasoline actually consumed in the operation of trucks over different types of road surfaces, are reported.

It was found that the poorest road surface, the earth, required 204 per cent more consumption of gasoline than the concrete. "The saving recorded between the two would pay toward the construction of the smooth surfacing at the rate of $3,000 per mile per year on a road carrying a daily traffic of 500 motor vehicles." On smooth, hard roads, when the truck is operated on third gear there was a certain waste of gasoline, while on the softer roads, or those pulling harder, there was not so much difference. When the trucks were loaded with 2 tons and operated on fourth gear on commercial runs, it was found that the amount of gasoline consumed per mile on the hard, smooth roads—concrete and the smooth brick—was about 0.085 gal., as compared with a consumption of 0.173 gal. on the earth road.

"In proportion as the surface of the road was of a character that offered greater resistance, the increase in the amount of gasoline is to be noted. Thus, on the brick road which was somewhat worn there was an increase of 19 per cent, on the bituminous macadam 24 per cent, on the good gravel 25 per cent, and on the fair gravel road 64 per cent of the amount of gasoline consumed over the hard, smooth surfaces."

Good roads pay for themselves twice every year, J. C. Veenhuyzen (*Engin. News-Rec., 83* (*1919*), *No. 5, pp. 214, 215*).—This report states that a comparison of accurate traffic censuses with haulage contract prices over both improved and unimproved roads in Los Angeles County, Cal., shows highway improvements to be an economic investment. On the basis of available data it has been found that three main roads have paid for their original cost about nine times during four years.

Tests of thin-base monolithic-brick road, H. H. Edwards (*Engin. News-Rec., 83* (*1919*), *No. 3, pp. 134, 135, fig. 1*).—Three years' service tests of a monolithic-brick road with a very thin layer of concrete for the lower portion have confirmed the results of laboratory experiments that a monolithic-brick slab is as strong as a 1 : 2 : 3 gravel concrete of the same thickness.

Comparison of road subgrade and air temperatures, C. C. Wiley (*Engin. News-Rec., 83* (*1919*), *No. 3, pp. 128, 129, figs. 2*).—The preliminary results of an investigation being conducted by the University of Illinois are reported, in which thermographic measurements are being made to study the variations in temperature between the atmosphere and the subsoil of hard-surface pavements. It has been shown that changes in temperature are transferred very slowly from the air to the subsoil. The studies are being continued.

Capacity load and ruling grade in highway transportation, R. C. Barnett (*Engin. and Contract., 52* (*1919*), *No. 23, pp. 637, 638, figs. 3*).—This report includes a mathematical analysis of the relation between capacity load and ruling grade for trucks and trailers, and graphic data which show that the trailer load falls off more rapidly for the hard, smooth type of pavement than it does for the other kind. In order to preserve the advantage which the hard, smooth pavement offers on a level grade, the ruling grade must be made considerably less than that allowed on an inferior road surface.

Comparative cost of maintaining roads with tractor outfit and eight-mule outfit, N. C. Hughes, jr. (*Munic. and County Engin., 57* (*1919*), *No. 3, pp. 115, 116, fig. 1*).—Comparative cost data on road maintenance with a 15–25 h. p. tractor and an 8-mule outfit working two 7-ft. blade road machines show a cost per mile at 9 miles per day of $1.89 for the tractor and a cost per mile at 10 miles per day of $2.53 for the mules. When using a 3-way drag the cost per mile was $1.334 for the tractor and $1.80 for a 6-mule outfit.

Maintenance costs of primary highways in Washington for two-year period, G. F. Cotterill (*Munic. and County Engin., 57* (*1919*), *No. 2, pp. 51–56*).—This report presents tabulated statements summarizing the expenditures charged against the primary highways of the State of Washington for their maintenance, repair, and equipment from June, 1917, to May, 1919, inclusive.

A general conclusion drawn with reference to the relative cost of upkeep of macadam and hard-surfaced roads is that at least $500 per mile is being saved wherever a properly built hard-surface road has replaced macadam or gravel on heavy-traffic highways.

Proportion and reasonable economy in rural road design, W. G. Harger (*Engin. News-Rec., 83* (*1919*), *No. 7, pp. 324–327, fig. 1*).—The author discusses proportion and economy in grading, foundations, widths, and courses on the basis of data gathered during 10 years' inspection experience, and reviews plans for some 2,000 miles of proposed road improvements. While the general impression produced by this study was not favorable, it is stated that the most encouraging feature lay in the marked improvement in practice over 8 to 10 years ago.

Road materials in the vicinity of Regina, Saskatchewan, L. Reinecke (*Canada Dept. Mines, Geol. Survey Mem. 107* (*1919*), *pp. I+28, pl. 1, figs. 5*).—This is a report of a survey of road materials in the vicinity of Regina, Saskatchewan, during the summer of 1917, covering an area 50 miles by 25 miles, the traffic on the country roads of which is considered to be the heaviest in Saskatchewan. The materials available for road surfacing in the area are glacial bowlders, gravels, and sands. Laboratory tests on these materials are also reported.

General specifications for road work (*Springfield, Ill.: Dept. Pub. Works and Bldgs., Div. Highways, 1919, pp. 108*).—These are the road work specifications of the Highway Division of the Illinois Department of Public Works and Buildings, and cover especially construction details relating to earth work, base courses, pavements, concrete, etc.

Charted summary of State concrete road specifications, A. N. Johnson (*Engin. News-Rec., 83* (*1919*), *No. 4, pp. 160–162, figs. 2*).—This article contains a chart which summarizes the main features of the latest specifications for concrete roads of the various State highway departments.

A relatively large proportion of the specifications call for a definite grading by sizes for fine aggregate. The French coefficient for wear for coarse aggregate is specified in perhaps a third of the specifications. The requirements vary from 12 to 6. In the mixing there is a very general agreement as to the proportions to be used, the majority of specifications calling for a 1:2:3 mixture. Most specifications now indicate the time for mixing, the larger number prescribing 1 minute, while 10 States require 1½ minutes, and but 1 or 2 as short a time as ¾ minute. The measuring of materials is generally emphasized, and specific requirements as to how this shall be done are found in many specifications.

There is a wide divergence in the provisions for joints. Four States specify no expansion joints at all, the others requiring expansion joints spaced at intervals varying from 25 to 40 ft.

The provisions for finishing afford interesting comparisons, the general tendency being to provide those methods which will insure a dense and true surface. Requirements that the concrete be covered with wet earth are general. In a few instances, ponding is specified. Most States require that the concrete shall be covered from 10 days to 2 weeks. In one instance it is as low as 8 days. There is more variation as to the time a road is to be kept closed to traffic, the limits prescribed being between 8 days and 30 days.

Points of importance which the author considers to be inadequately covered are the permissible variation from a true surface and the consistency of the mixture.

Concrete in roads, bridges, and culverts, H. E. Breed (*Munic. and County Engin., 56* (*1919*), *No. 6, pp. 222–225, fig. 1*).—The author describes field tests of the materials for concrete roads, and reports the results of impact tests made with the New York Highway Department impact testing machine, which showed that "crushed stone concrete resists impact better than gravel concrete. Large sized material is more durable than the small sizes. Toughness is a very important factor in aggregate that is subjected to impact. The fine and coarse aggregate must both be good if we are to get the most from the pavement. Coarse grained sand mortar resists impact better than a mortar made with finer grained sand." No relation has been observed between compressive strength and resistance to impact.

Methods of handling the materials are also discussed.

Bond between steel and concrete, M. O. FULLER (*Concrete* [*Detroit, Mich.*], *15* (*1919*), *No. 5, pp. 201–203, figs. 5*).—Experiments on the strength of bond between concrete and steel, conducted at Lehigh University, are reported, in which a 1:2:4 concrete and several types of ¾-in. reinforcing steel were used. The concrete was tamped parallel to the axis of the steel in some of the specimens and normal to the axis of the steel in others. The vertically tamped specimens consisted of a cylindrical block of concrete 6¾ in. in diameter, with an embedment of 8 in., and the normal tamped specimens were 8 by 8 in., with an embedment of 12 in.

The results seem to indicate that "the adhesive resistance must be overcome before sliding resistance comes into action. The pull-out tests with plain round and square bars show considerable bond stress developed before a measurable slip is produced; then after the adhesive resistance is overcome, a further slip is accompanied by an increasing bond stress until a maximum is reached. The bond then rapidly decreases, the amount of decrease being about one-half the maximum value. The results of plain square bars give values about 90 per cent of plain round bars. In the tests with deformed bars, it appears that the projections play an important part in increasing the frictional resistance rather than the adhesive resistance. The comparison of the results show that the concrete vertically tamped gives a much higher bond stress, due to better adhesion. The horizontally tamped round bar gave an average bond at zero slip of 286, compared with 259 of the square bar. The vertically tamped round and square bars gave values of 348 and 350, respectively. The results further show a marked advantage attained by the use of deformed bars."

Structural engineers' handbook: Data for the design and construction of steel bridges and buildings, M. S. KETCHUM (*New York: McGraw-Hill Book Co., Inc., 1918, 2. ed., pp. XV+896, figs. 671; rev. in Engin. and Contract., 52* (*1919*), *No. 17, p. 456*).—This handbook gives data, details, and tables for the design and construction of steel bridges and buildings, and is intended for the structural engineer and engineering student.

Motor vehicle engineering: Engines, E. FAVARY (*New York: McGraw-Hill Book Co., Inc., 1919, pp. 12+333, pls. 4, figs. 199*).—This book deals with the practical features of the design of internal explosion engines for trucks, automobiles, and tractors. It contains the following chapters: Engine principles; compression, combustion, and expansion of gas; cylinder clearance and compression; theory of four-cycle engine disclosed by indicator diagram; cylinder dimensions; valves; valve timing, cams, camshafts; camshaft and accessory drives; pistons; connecting-rods; crank shafts—engine balancing; kinetic forces; flywheels; crank cases; lubrication of engines; offset cylinders; manifolds; engine cooling, combustion chambers, etc.; power of engines—efficiency—torque; brake horsepower tests of automobile engines; mean effective pressure; the manograph; brake horsepower test by electric dynamometer; brake horsepower test by hydraulic dynamometer; tractive effort and power required for motor vehicles; tractive factor, torque, etc.; materials; hardening steel; and methods of testing the hardness of metals.

The relation of time of ignition to the economy of the gasoline engine, J. P. CALDERWOOD and A. J. MACK (*Power, 50* (*1919*), *No. 14, pp. 532, 533, figs. 2; also in Gas Engine, 21* (*1919*), *No. 12, pp. 390, 391, figs. 2*).—Studies conducted at the Kansas State Agricultural College on the effect of spark advance upon the economy of a 25-h. p., 4-stroke cycle, horizontal gas engine, equipped with a throttling governor and wipe spark ignition, are reported.

It was found that spark advance above that nominally carried produces no increase in economy of the engine. It was brought out that with other conditions constant the economical spark advance to be carried depends upon the fuel mixture. With richer mixtures higher spark advance may be utilized. With a richer mixture and higher spark advance the maximum delivered horsepower will be greater than can be secured with leaner mixtures and smaller spark advance. This does not contemplate, however, the use of fuel mixtures so rich that incomplete combustion may result. The economy will probably decrease as the richness of the fuel mixture increases. The fuel economy of the gasoline engine depends very largely upon the carburetor setting, but the poorer economy due to improper carburetor adjustment can be largely corrected by altering the position of the spark. The economy of the throttle-governed engine can be improved by the use of a variable spark advance, especially upon those engines that are operated under variable loads.

"If the best economy at all loads of throttle-governed engines is to be secured by altering the time of ignition, the maximum throw of the spark should be greater than 30°. A zero spark angle should be provided for starting, about a 30° angle for full load, while a 50 or 60° angle should be provided for lighter loads."

N. G. E. A. data sheets, compiled by H. R. BRATE (*Lakemont, N. Y.: Natl. Gas Engine Assoc., 1918, rev., pp. [103], figs. 21*).—This is a revised edition of volumes 1, 5, and 6 of this data book (E. S. R., 36, p. 590).

Agricultural tractors, R. N. TWEEDY (*Better Business, 3 (1918), No. 2, pp. 119–137*).—This is a summary of the general features considered desirable in tractors for general purpose use of farmers in the United Kingdom, based on experimental data from different sources.

"The farmer will be well advised to estimate his plowing by tractor at not more than 2 acres per day—1.5 would be safer—averaged over the whole plowing period and taking 60 hours per week as the possible working time. . . . There seems to be no good reason for buying any tractor, except perhaps the large steamers, which requires more than one man to work the whole outfit. . . . It is clear that within the defined limits a wheeled machine with a driving axle load of 4,400 lbs., and driven by an engine capable of developing 23 to 25 horsepower, will do all that the farmer requires."

Notes on tractors, M. RINGELMANN (*Ann. Inst. Natl. Agron., 2. ser., 13 (1918), No. 2, pp. 247–274*).—This is a summary of the results of a number of tests of tractors and tractor engines made during the past several years in France, from which the following conclusions are drawn:

The weight of the tractor should not exceed 2,800 to 3,000 kg. (6,160 to 6,600 lbs.). With such a weight an average drawbar pull of 600 to 700 kg. is available. Beyond an average effort of 600 to 700 kg. the tractor frame is deformed and the fuel consumption and depreciation become excessive. If the conditions of the work to be done require a tractive effort exceeding 600 to 700 kg. the tractor should be abandoned in favor of funicular apparatus.

For proper steering, two-thirds of the total weight of the tractor should be on the driving wheels and one-third on the steering wheels, and two steering wheels give better results than one. The weight of the tractor, relative to the length of the wheel generatrices should not exceed 30 to 35 kg. per centimeter of width of wheel rim. The diameter of the drive wheels should be limited between 1.1 and 1.4 meters (3.6 to 4.6 ft.)

Where there is an exterior chain drive there should be a clearance of 25 to 30 cm. (9.8 to 11.8 in.) between the lowest part of the chain drive and the plane of rolling. It is desirable at the time of turning to throw out the differential and use only one driving wheel. With one drive wheel in the furrow and one on the land the differential works constantly on an incline, and one of its gears is used more rapidly than the other.

Of the gripping attachments to the drive-wheel rim, corners and pallets injure the soil less than ogives and knobs, which strongly compress the soil. Corners or pallets should not be used on virgin soil. The use of one steering wheel rolling in the furrow is not desirable. For normal cultivation the best engine to adopt is one of not exceeding 25 h. p. with high speed and multiple cylinders and the pump should be gear driven and the fan belt driven.

The use of tracks is not advisable owing to their high cost and rapid depreciation. The operation of motorized push plows is very difficult. The double cable plow is deemed a good plow for average work. With an average tractive effort of from 600 to 700 kg. a maximum speed of about 4,000 meters (2.5 miles) per hour, can be reached, but beyond this speed operation becomes difficult and the draft increases rapidly. A speed of about 3,000 meters per hour is preferable. Under the same conditions an increase of 1 to 2.5 meters per second in speed increases the tractive effort from 100 to 118 kg.

The furrows should be at least 150 meters long for the practical use of a tractor, and the average time of turning will be about a half minute. Best results are obtained on tractor plowing when two men are employed.

Some means of easement or shock absorption should be inserted between the tractor and plow. This has been found to greatly reduce general depreciation. Best results with tractor cultivation can be obtained on a field 1,000 to 1,500 meters long and with a grade not exceeding 7 to 10 per cent.

The work of the motor tractor, G. H. GARRAD (*Jour. Roy. Agr. Soc. England, 79 (1918), pp. 1–24*).—This is a general review of the results of experience in England with Government tractors during the war emergency, in which several plowing experiments and the advantages and disadvantages of tractors are summarized. Considerable cost data are also given, which show that a tractor in private hands should plow from 2.5 to 4.5 acres of land per eight working hours, according to the make of the tractor, with a fuel consumption of 3 to 4 gal. per acre. "Under ordinary circumstances, it will not pay an occupier of less than 200 acres of arable land of average texture to own a tractor, but an occupier of a heavy land farm would be justified in owning a tractor on a smaller acreage."

The problem of adherence in mechanical cultivation, A. DE PONCINS (*Vie Agr. et Rurale, 9 (1919), pp. 332–339, figs. 14*).—Different types of soil grip attachments for the drive wheels of tractors are described as developed in different American and foreign-built machines.

The Widen type of cultivator, E. WIBECK (*Skogsvårdsför. Tidskr., 16 (1918), No. 2, pp. 105–130, figs. 12; also in Meddel. Stat. Skogsförsöksanst, No. 15 (1918), pp. 17–42, figs. 12*).—This article describes a cultivating apparatus which is a combined cultivator and seeder. It is intended for use in cut-over forest areas for cultivating the soil and seeding for new trees. The frame is wood and the whole apparatus is pivoted on one wheel about 30 in. in diameter. The plow proper has a small straight-lined moldboard, and cuts a furrow about 4 to 6 in. wide. The seeder is placed directly over the plow and is chain-driven from the wheel. The apparatus is drawn by one horse, and is so arranged that the whole may be inverted, when not in use, for transportation on the single wheel.

Field tests on forest soils of northern Sweden are reported. One horse and two men were required for the work. The apparatus was found to give very good results on such soils, which are covered with stumps and brush and filled with roots and stones. The best results were obtained when the plow was alternately raised or lowered in accordance with the character of the soil, thus providing a continuous furrow. Specially good results were obtained on a thin humus covering, but poorer results on a matted sod. On pine heather land it was found that an area could be cultivated varying with the furrow width from 2.37 to 2.98 hectares (5.85 to 7.36 acres) per 10-hour day, while on plain pine-tree soils the area varied from 1.31 to 1.65 hectares.

The seeding apparatus did not function as satisfactorily as the plow, and the number of seeds dropped decreased with the amount of seeds in the container.

Haymaking machinery, J. R. BOND (*Jour. Roy. Agr. Soc. England, 79 (1918), pp. 55–68, figs. 5*).—This is a summary of recent improvements and developments in haymaking machinery in England.

Flue curing tobacco barns and packing house, A. C. JENNINGS (*Rhodesia Agr. Jour., 16 (1919), No. 5, pp. 409–413, pls. 3*).—Drawings and specifications for approved types of barns and packing houses for tobacco curing are given.

Hog houses for South Dakota, R. L. PATTY (*S. Dak. Agr. Col. Ext. Circ. 7 (1918), pp. 32, figs. 28*).—This circular describes and gives detailed drawings, specifications, and some bills of material for different types of hog houses considered suitable for Dakota conditions, including the modified Iowa sunlit hog house, the Dakota hog house, the North and South frame house, the half-monitor house, and the shed house.

Suggestions for the improvement of Vermont dairy stables, J. L. STRAHAN (*Bul. Vt. Dept. Agr., No. 28, pp. 53, figs. 24*).—This bulletin contains suggestions for lighting and ventilation of dairy stables, for manure disposal, the construction of stable floors, and the second-story stable floor, based on a survey of dairy-barn conditions throughout the State of Vermont.

"In planning a new cow stable, there is at present probably no better arrangement than the following: (1) Cows to be housed on the ground, either in a basement or on the ground floor of a two-story barn, (2) floor to be of concrete, (3) barn to be at least 34 ft. wide inside, providing space for two rows of cows facing either in or out, suiting the desire of the owner, (4) basement or ground floor to be sealed inside and sided outside, making a tight wall, (5) a proper ventilation system to be installed, (6) a sufficient amount of light provided through single sash tip-in windows, preferably nine lights each 9 by 12 in., and (7) provision for manure disposal either by drawing to the field each day or in the use of a properly constructed manure pit."

Considerable tabular structural data are given, and specifications for a special leveling rod for use in establishing stable floor grades and specifications for preservative treatment of lumber with creosote oil are appended.

Milk houses for Vermont dairy farms, J. L. STRAHAN (*Bul. Vt. Dept. Agr., No. 27, pp. 23, figs. 8*).—This bulletin outlines the essentials for a milk house suitable for Vermont conditions and gives drawings and specifications for three different types, also drawings and specifications for an inexpensive ice house.

Lightning protection, C. F. HARDING ET AL. (*Purdue Univ. Pubs. Engin. Depts., 2 (1918), No. 1, pp. 8, figs. 5*).—This is a nontechnical discussion of lightning and lightning protection with particular reference to Indiana.

RURAL ECONOMICS.

Rural community buildings in the United States, W. C. NASON and C. W. THOMPSON (*U. S. Dept. Agr. Bul. 825 (1920), pp. 36, figs. 17*).—A study of 256 community buildings, including school and church community buildings, farmers' fraternal society buildings, and library and community buildings, found in the open country and in towns of more than 2,500 and less than 2,500 population, is reported on. The buildings have been arranged in five classes based on the methods of financing, as those financed by local manufacturing concerns, through individual donations, through club or society initiative, by the local government, or through community endeavor. The general character of these buildings, maintenance, operation and management, and uses to which they are put are noted, and several specific examples are described in detail.

The rural community fair, C. J. GALPIN and E. F. HOAG (*Wisconsin Sta. Bul. 307* (*1919*), *pp. 48, figs. 13*).—This bulletin gives many suggestions and illustrative material on planning and organizing the small community fair; on arranging exhibits, contests, pageants, and community games; and on financing the event.

The American farm woman as she sees herself, E. B. MITCHELL (*Mich. Food and Drug Mo., 1919, Nov., pp. 9–13*).—This article has been previously noted (E. S. R., 33, p. 294).

Report of the Mission to the United States, F. BARBEDETTE (*Dir. Gén. Agr., Com. et Colon.* [*Tunis*], *Bul. No. 95* (*1919*), *pp. 3–99*).—A report is made of the study of agricultural conditions in the southern and southwestern sections of the United States, made between October, 1918, and February, 1919, by a special mission from Algeria.

A contribution to the bibliography of agriculture in Virginia, E. G. SWEM (*Bul. Va. State Libr., 11* (*1918*), *No. 1–2, pp. 35*).—A collection of references on the history of colonial, post-revolutionary, and later agriculture in Virginia, and on agricultural practices, has been edited from manuscript prepared about 40 years ago by N. F. Cabell.

Articles relating to agriculture, R. RAMOS BASCUÑANA (*Pro Agricultura. Alicante,* [*Spain*]*: Estab. Tipog. Viuda de Antonio Reus, pp. VIII+411*).—Numerous brief articles relating to the rural credit and savings bank of the town of Elche, Spain, and to agricultural conditions and legislative needs in the Province of Alicante have been collected in this volume.

An economic history of landholding, wages, and prices of commodities from 1200–1800, G. D'AVENEL (In *Histoire Economique de la Propriété, des Salaires, des Denrées, et de Tous les Prix en Général depuis l'an 1200 jusqu'en l'an 1800. Paris: Ernest Leroux, 1913, 2. ed., Vols. 1, pp. 159–409, 495–601; 2, pp. 41–159, 219–528; 3, pp. 1–107, 175–338, 424–570, 625–645; 4, pp. 75–511, 574–598*).—This historical study includes detailed tabulated data and text with reference to the progress of wages and status of agricultural labor, prices of farm products, methods of holding and cultivating land, and returns on investment in land in France from 1200 to the end of the eighteenth century.

A report on large landholdings in southern California, with recommendations (*Sacramento: Cal. Comn. Immigr. and Housing, 1919, pp. 43*).—Statistics of landholdings given in this report have been compiled from the tax records of the various counties.

Some of the findings are that in the eight counties of southern California there are about 255 holdings, each of more than 2,000 acres; that the Southern Pacific grant lands and lieu lands in five of these counties aggregate 2,598,775 acres; that 50 per cent of the "lands in farms" are owned in about 250 holdings; and that there are at least 32 holdings each of more than 15,000 acres, 7 of which exceed 50,000 acres each, 1 of which is of 101,000 acres, and another of 183,399 acres. Remedial suggestions offered include the extension on a large scale of the plan of the Land Settlement Board and the adoption of a graduated land-value tax.

A large State farm, A. G. WEIGALL and C. WREY (*London: John Murray, 1919, pp. XIII+82*).—An outline of a project for a State leased and operated farm is given, covering such points as acquisition of the land, the staff necessary, equipment, farm plan, live stock, educational facilities, and financial basis.

Collective leases in the Provinces of Parma, Bologna, and Ferrara, and in Lombardy (*Internatl. Inst. Agr.* [*Rome*], *Internatl. Rev. Agr. Econ., 10* (*1919*), *No. 8–10, pp. 447–463*).—Information of later date than that noted (E. S. R., 40, p. 893) is dealt with.

The land tax in China, H. L. Huang (*Columbia Univ. Studies Hist., Econ., and Pub. Law, 80* (*1918*), *No. 3, pp. 180*).—This is a brief survey of the development of the land-tax system from earliest times to the close of the Ming dynasty, with a more detailed discussion of the land policy; the system of land holdings; modes of acquiring and transferring lands; the nature and development, and the collection and administration, of the land tax and other phases during and since the Tsing dynasty, bringing out various forms of expression taken on by the land policy of China, which has always been to bring as much land under cultivation as possible. This treatment makes it apparent that the system at present is antiquated, and several suggested reform plans are analyzed critically. Improvements introduced since the Republic are reviewed, and fundamental problems of land-tax reform are discussed. Appendixes are given covering a bibliography, units of measurement, names and epochs of the dynasties in China, reigning periods of the emperors of the Tsing dynasty, and returns of the land tax.

Minimum wages for agricultural labor in England and Wales (*Internatl. Inst. Agr.* [*Rome*], *Internatl. Rev. Agr. Econ., 10* (*1919*), *No. 8–10, pp. 543–564*).—Information from official sources, including Board of Agriculture and Agricultural Wages Board orders and publications, has been abstracted to show the constitution and work of the Agricultural Wages Board in fixing rates of wages and hours of working for men and women agricultural laborers.

The wages of rural labor (*Internatl. Inst. Agr.* [*Rome*], *Internatl. Rev. Agr. Econ., 10* (*1919*), *No. 8–10, pp. 564–568*).—This is a résumé of findings of a government commission reporting in 1908, reports of the Direction of Agriculture of Holland for later years, and the report of the Labor Commission formed by the Dutch Farmers' Union published in 1919. It is shown that in 1915 and in 1916 wages underwent increases of about 20 per cent, making an increase in earnings since 1912 of about 61.2 per cent. Wages in 1917 sometimes reached the double of what they had been before the war, but unemployment increased and the number of days of work diminished. The data summarized indicate that wages are not unduly higher than in the period 1905–1908.

The value of farm bookkeeping and cost accounting (*Agr. Costings Com.* [*Gt. Brit.*] [*Leaflet*] *4* [*1919*], *pp.* [*4*]; *also in Jour. Bd. Agr.* [*London*], *26* (*1919*), *No. 7, pp. 708–712*).—This leaflet by the Agricultural Costings Committee of Great Britain briefly discusses the practical, general, and national importance, and some of the requisites, of satisfactory farm cost accounts.

Agricultural bookkeeping, W. I. Manrique (*Rev. Agr.* [*Colombia*], *5* (*1919*), *No. 3, pp. 146–169*).—Three models for making a farm inventory and keeping accounts are offered, one for small farmers, and others more detailed for larger operators.

Wheat handling and grading in America, E. Harris (*Dept. Agr. N. S. Wales, Farmers' Bul. 128* (*1919*), *pp. 17, figs. 7*).—An account is given of the author's visits to wheat-growing and marketing centers in the United States and Canada between June, 1918, and March, 1919.

Elevator construction, methods of loading and unloading cars and steamers in various grain-handling centers and ports of the United States and Canada, and Government means of licensing elevators and defining and establishing wheat grades, are noted and compared. On the basis of his observations, the author makes recommendations for Australia in the matter of management of grain elevators and inauguration of a grain-grading system. He outlines the provisions of a grain bill and topics for investigation.

[Notes on grain elevator operations in North Dakota] (*North Dakota Sta. Spec. Bul., 5 (1919), No. 15, pp. 346–359*).—Statistical information, compiled by J. I. Brady, and relating to the volume of business handled and the cost of operating grain elevators of different capacities, is presented and discussed, together with brief notes on the milling qualities of the North Dakota wheat crop for 1919 and the cost of producing wheat in the State.

The farmers' elevator movement in Ohio, H. E. Erdman (*Mo. Bul. Ohio Sta., 4 (1919), No. 11, pp. 331–335, pl. 1, figs. 4*).—A survey similar to the one previously noted (E. S. R., 40, p. 592), completed June 1, 1919, located 162 companies operating grain elevators at 174 marketing points, and it is estimated that on October 15, 1919, there were nearly 200 companies in operation in the State. The rapid increase is said to be due to the fair or even large dividends returned; to the fact that dealers began buying wheat at rather wide margins; to competition, which forced prices several cents higher in a number of localities where farmers' companies were operating; and to the organizing activity of several associations. This report indicates a tendency toward strengthening farmers' companies by centralized operation and toward greater capitalization.

Flour and mill feed prices, F. C. Himbee (*North Dakota Sta. Spec. Bul., 5 (1919), No. 15, pp. 360–368*).—The author compares the prevailing prices of flour and wheat by-products with the prices prevailing during the period of Government control, and concludes that, "taking all the facts of this report into consideration, we believe that price regulation by the Government is an important factor in reduction of prices, and is worthy of the attention of the law-making bodies of the country."

Monthly Crop Reporter (*U. S. Dept. Agr., Mo. Crop Rptr., 5 (1919), No. 12, pp. 121–140*).—This number contains the usual estimates of acreage and production, and data relating to farm and market value of important products; a crop summary for 1919 showing acreage, production, and farm value, December 1, of important farm crops; crop statistics for 1917–1919 for 23 crops; and tabulations of aggregate crop-value comparisons of 13 crops in 1919, 1918, 1913-1917, and 1909; tables showing the averages for the United States of the wages of hired male farm labor for 25 different years between 1866 and 1919, inclusive, and by States in 1919, 1918, and 1910; and many miscellaneous statistics. The index for the year is included.

The Market Reporter (*U. S. Dept. Agr., Market Rptr., 1 (1920), Nos. 1, pp. 16; 2, pp. 17–32; 3, pp. 33–48; 4, pp. 49–64*).—The *Seed Reporter* and *Food Surveys* have been merged in this weekly publication of the Bureau of Markets, which includes also other information which has heretofore been issued in mimeograph form. Information is given in leading articles, weekly and monthly summaries of movement, marketing, and prices of specified commodities, and tabulated statistics with interpretative text, with regard to important classes of agricultural products.

As leading articles No. 1 contains an announcement of the publication, and a summary of the periodical reports issued during 1919 by the Bureau of Markets; No. 2, a review of the live-stock market for 1919; No. 3, a general article on the direct marketing of farm produce; and No. 4, an article on the produce inspection service of the bureau.

[Agricultural statistics of Japan] (*Résumé Statis. Empire Japon, 32 (1918), pp. 18–21; 33 (1919), pp. 18–21*).—Statistics of agriculture, live stock, and forestry, previously noted (E. S. R., 37, p. 792), are continued for later years.

AGRICULTURAL EDUCATION.

The function of agricultural instruction in the promotion of production, C. Coutinho (*Bol. Assoc. Cent. Agr. Portuguesa, 21 (1919), Nos. 7, pp. 201–223; 8, pp. 236–250, fig. 1*).—This is a discussion of the social mission of the agronomist, agricultural stations, agricultural services of the State, movable and itinerant agricultural schools, and the official agricultural budget.

The author concludes that the social mission of the agronomist should be, above all, that of instructor, experimental adviser, and propagandist, while the mission of the agricultural foreman (regente-agricole) should be that of assistant to the agronomist. Portugal being the only country in Europe which does not possess at least one experiment station, it is deemed necessary that there should be organized in the country, as soon as possible, at least five or six of these institutions for agricultural investigation. Recognizing the need of a reform in the official agricultural services of Portugal, the author would supply the deficiencies by the introduction of a number of itinerant agricultural schools, around which would gravitate all the regional services. Only agronomists with the title "Agronomos do Estado" should superintend these schools. As Portugal is an agricultural country, it is urged that larger appropriations be included in the budgets for agricultural schools, subventions, premiums, etc. An epitome of agricultural instruction in Belgium, Germany, and Italy is included, showing how an intensification of production has resulted from a broad and intense diffusion of agricultural instruction, from a closer association between the workers, and from agricultural credit institutions, in which, as in the Reiffeisen, bureaucratic formalism does not exist.

The duty of agriculture toward the war injured, J. Amar (*Le Devoir Agricole et les Blesses de Guerre. Paris: H. Dunod and E. Pinat, 1917, pp. [IV]+22, figs. 8*).—The author discusses the importance of agricultural reeducation, former conditions and defects of agriculture, modern conditions of rural life, and the readaptation of rural invalids, and points out the opportunities in France for education in agriculture for those injured in the war.

The university school of forestry, H. H. Corbin (*Sci. and Indus. [Aust.], 1 (1919), No. 7, pp. 433–436*).—With reference to the theory advocated by some that there should be only one center of training for the foresters of Australia and for all research and investigation, and that this should be situated in the forest, the author holds that there can not be a better idea than that of training those who are to be engaged in the mere routine practice of forestry in a good elementary school of forestry in a forest where most of the instruction is given in the outside forest. This type of school, however, would utterly fail in turning out the type of forester and scientist most needed. The author would have a good university school of forestry, or even two, but is emphatic that it is immaterial whether that practical training ground is near the university or 30 or 50 miles away, provided easy communication be possible. The great advantages which universities offer, in his opinion, are that there is a minimum of expense entailed in grafting forestry into the university course, political interference is practically eliminated, and absolute continuity of practice and work is assured in congenial and stimulating surroundings. It is stated that at one time in Europe and America all forestry was taught in the forest, but the isolation of such schools from other centers of culture, such as universities, colleges, libraries, museums, botanic gardens, and such concerns as factories and timber yards tended to make the staff and students one-sided in outlook, and now forestry schools in which the higher training is given, are with one or two exceptions, associated with universities in centers of higher culture.

The author recommends for Australia that every graduate in forestry be allowed to visit and work in some of the forests of the Old World for 12 months after completing the course in Australia and before being admitted as a graduate to an Australian university. This would make the course after matriculation, a 5-year course of practical and theoretical forestry combined as follows: One year in the Australian forests as a forest workman; three years in the university, together with practical work in the forest, during all vacations; and finally, one year in the forests of Europe on more advanced study of methods, species, and conditions. The course at the Adelaide University extends through four years, which, with a year in Europe, would make it a 5-year course.

The destiny of the Veterinary High School in Dorpat, ZALEWSKY (*Berlin. Tierärztl. Wchnschr., 34 (1918), No. 33, pp. 321–324*).—A review is given of the history of the Veterinary High School in Yuryev (Dorpat), which was established in 1848 and closed June 1, 1918. The advisability of reopening the school is discussed.

Report of the Minister of Agriculture of the Province of Quebec, 1918–19, J. E. CARON (*Rap. Min. Agr. Prov. Quebec, 1918–19, pp. XIV+170, pls. 22*).—This is the annual progress report of the Department of Agriculture of the Province of Quebec, including the activities of department officials; agricultural, veterinary, and domestic science education institutions; experimental institutions; the extension service, etc.

Agricultural services and the promotion of agriculture, JONNART (*Exposé Situation Gén. Algérie, 1917, pp. 481–547*).—This is a report, by the Governor General of Algeria, on the Government activities in the promotion of agricultural education, research, and extension work in 1917, including reports on the Algerian School of Agriculture at Maison-Carrée and the Experiment Garden of Hamma and its auxiliaries.

In connection with the garden there has been established an experiment station on the estate of Habra at Ferme-Blanche. A plan has also been prepared by the director of the botanical service for the establishment of a station especially for date culture in the Touggourt section. A school of agricultural housekeeping in connection with the garden at Hamma is under consideration, and appropriations have been included in the budget for the establishment of an experiment station for mutton production at Djelfa, and for the purchase of the necessary land for the establishment of an experiment station near Briska. The School of Agriculture of Philippeville has remained closed since the beginning of the war.

Reference is made to the decree of October 22, 1916, which placed the agricultural services under the exclusive authority of the Governor General. In compliance with the provisions of this decree the chairs of agriculture (departmental directors of agricultural services and professors of agriculture), together with the school of agriculture of Philippeville, have been transformed since January 1, 1917, into an exclusively colonial service known as the General Agricultural Service (Service Agricole General), to distinguish it from the technical service. In each department or division of the country the new service is placed under the authority of a chief of the General Agricultural Service. For the professors of agriculture (formerly known as professeurs d'arondissement) have been substituted agricultural advisers (conseillers agricoles).

Plan for the cooperation of the Kansas State Board of Education with the Federal Board for Vocational Education, 1919–20 (*Kans. Dept. Ed., Vocat. Ed. Bul. 4 (1919), pp. 43*).—This is a statement of the approved plans for vocational education in Kansas for 1919–1920. Outlines of suggested types of courses for evening classes in clothing for the family, the use and preparation of foods, and for all-day home economics classes are included.

Plans adopted for meeting the provisions of the Smith-Hughes Act in Mississippi, 1919–20 (*Miss. Dept. Pub. Ed. Bul. 15* [*1919*], *pp. 40*).—These plans contain some revisions and additions to the plans for the previous fiscal year.

Vocational agricultural instruction in Mississippi may be given for reimbursement in separate agricultural schools, county agricultural high schools, departments of agriculture in high schools, consolidated schools, and county training schools for negroes. In general it is proposed to use from 40 to 50 per cent of the teacher-training fund for 1919–20 for agricultural subjects and supervision, and from 25 to 35 per cent for home economics subjects and supervision.

The Mississippi Agricultural and Mechanical College (for white students) and the Alcorn Agricultural and Mechanical College (for colored students) have been designated for the training of teachers, supervisors, or directors of agricultural subjects. The courses in both institutions, extending over four years and three years, respectively, must consist of from 38 to 50 per cent of technical agricultural subjects and at least 10 per cent of subjects in education.

Outlines of these teacher-training courses, typical courses in vocational agriculture for the various types of secondary schools, a 4-year vocational home economics course in city high schools, and 4-year teacher-training courses in home economics at the Industrial Institute and College (for white students) and the Alcorn Agricultural and Mechanical College are included.

Vocational agriculture in the secondary schools of Virginia, T. D. EASON (*Bul. State Bd. Ed.* [*Va.*], *2* (*1920*), *No. 3, pp. 71, figs. 24*).—This bulletin contains a report on the status of vocational agriculture in secondary schools in Virginia at the time the State accepted the provisions of the Smith-Hughes Act; a list of schools approved for agricultural instruction under the act from 1917–18 to 1919–20, inclusive; information with reference to the place of the teacher of vocational agriculture in the school system; cooperation of teachers of vocational agriculture and county agents; the assignment and supervision of agricultural projects, and uses of the required five acres of land; an outline of a curriculum, together with description of courses, for departments of vocational agriculture extending through four years (eighth to eleventh grades, inclusive), consisting of 16 units equally divided between academic and vocational subjects, and 2 project units; an outline of a curriculum for part-time classes; project study outlines for corn, pork, poultry, and Belgian-hare production; and minimum equipment required for instruction in vocational agriculture for a class of 10 students, including a list of reference books and journals, at a total cost of $1,303.19.

Rooms for a department of vocational agriculture: Their location, plan, and equipment, W. F. STEWART and E. F. JOHNSON (*Ohio State Bd. Ed. Vocat. Agr. Bul. 1* (*1919*), *pp. 15, figs. 6*).—Suggestive plans, together with the necessary equipment, are submitted for quarters consisting of two rooms and storage space, which are considered adequate provision for all recitations and laboratory work offered in the vocational agricultural units of any Ohio high school curriculum. It is assumed that farm shop work will be provided for in the manual training or wood and iron working department.

Agricultural instruction and small farming at the primary school, C. ARNOULD (*Vie. Agr. et Rurale, 9* (*1919*), *No. 46, pp. 357–361, figs. 5*).—The author suggests work in agriculture for the rural primary school in France that could be undertaken in the garden and orchard, experiment field and forge shop, poultry yard, rabbit hutch, with the beehive, etc. In his opinion the length of the school year would vary in different localities, but should be about 40 weeks. The time should be equally divided between general and professional subjects and between theoretical and practical instruction. The general instruction should comprise reading, writing, drawing, morals, literature, arithmetic, and the applied sciences.

Forty laboratory exercises in soils, P. W. FATTIG (*Gainesville, Fla.: Univ. of Fla., 1919, pp. 42*).—These exercises outline the object, materials needed, and method to be followed, and conclude with brief lists of test questions.

Seventy laboratory exercises in plant production, P. W. FATTIG (*Gainesville, Fla.: Univ. of Fla., 1919, pp. 81*).—Each exercise deals with the object, materials, and method, and concludes with a brief list of questions.

Profitable dairying, K. L. HATCH and G. H. BENKENDORF (*Chicago: Row, Peterson & Co., 1918, pp. 182, figs. 50*).—The topics in this book deal with the development of the dairy industry, the composition of milk, milk secretion, the Babcock test, the dairy cow, testing the farm herd, cream separation, the farm separator, the value of skim milk, the care of utensils, the care of milk and cream, disposing of milk and cream, butter making and cheese making, the barn, the silo, feed for the cow, care of the cow, tuberculosis, and the relation of dairying to the soil. Each chapter is followed by exercises and laboratory problems.

School gardens, A. E. BARTHE (*Rev. Agr., Com., y Trab.* [*Cuba*], *2* (*1919*), *No. 9, pp. 443–453, figs. 6*).—The author gives detailed directions for beginning and conducting school garden work, together with an outline of class instruction on seeds and the germinative processes to be given in connection therewith.

MISCELLANEOUS.

Federal legislation, regulations, and rulings affecting agricultural colleges and experiment stations (*U. S. Dept. Agr., States Relat. Serv., 1919, pp. 48*).—A revision to September 15, 1919, of the circular previously noted (E. S. R., 38, p. 95).

Twenty-fifth Annual Report of Montana Station, 1918 (*Montana Sta. Rpt. 1918, pp. 109–187, figs. 19*).—This, the twenty-fifth report of the station, comprises, in addition to the organization list, a financial statement for the fiscal year ended June 30, 1918, and the usual report by the director on the work, needs, and publications of the station during the year, a historical account of the organization and development of the station and a list of its publications since its establishment. Meteorological observations for the year are noted on page 419 of this issue.

Thirty-second Annual Report of South Carolina Station, 1919 (*South Carolina Sta. Rpt. 1919, pp. 51*).—This contains the organization list, a report of the director on the work of the station, a financial statement for the fiscal year ended June 30, 1919, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Annual Report of Virginia Station, 1918 (*Virginia Sta. Rpt. 1918, pp. 65, figs. 7*).—This contains the organization list, a report of the director on the work of the station, several special articles, and a financial statement for the fiscal year ended June 30, 1918. The experimental work reported is for the most part abstracted elsewhere in this issue.

Monthly Bulletin of the Ohio Experiment Station (*Mo. Bul. Ohio Sta., 4* (*1919*), *Nos. 10, pp. 299–327, figs. 10; 11, pp. 331–359, figs. 12*).—These numbers contain, in addition to several articles abstracted elsewhere in this issue and miscellaneous notes, the following:

No. 10. Home-mixed or Proprietary Feeds for the Dairy Herd, by A. E. Perkins.

No. 11. European Corn Borer not in Ohio, by H. A. Gossard; Fruits of Unusual Excellence: The Mother Apple, by C. W. Ellenwood; and Apple Varieties Adapted for Ohio Culture, by W. J. Green and P. Thayer.

NOTES.

California University.—*Breeder's Gazette* announces that J. I. Thompson, associate professor of animal husbandry at Davis, has resigned effective July 1 to assume the management of a nearby stock farm.

Purdue University.—A "better farm homes" special train was operated in March over the New York Central Railroad lines in Indiana under the auspices of the university, the State Home Economics Association, the Indiana Federation of Farmers' Associations, and the railway company. Four passenger cars were equipped to illustrate modern water, lighting, and power systems adapted to installation in farm homes, practical equipment for the kitchen, laundry, bathroom, etc., suggestions for farm-home furnishings, and the like. Lecturers and demonstrators accompanied the train, for which 75 stops were scheduled.

A similar train was operated in Ohio during February.

Kansas College.—Otis E. Hall, State leader of boys' and girls' clubs, has accepted a position as assistant in the Junior Achievement Bureau of the Eastern States League, and is in charge of its boys' and girls' clubs in Hampden County, Mass.

Kentucky University and Station.—The annual meeting of the American Berkshire Congress was held at the college of agriculture February 16–18, with a representative attendance. The program included an address of welcome by Dean Thomas P. Cooper of the college; papers on the Outlook for the Swine Industry, by Dean C. F. Curtiss of Iowa; Establishing a Pure-Bred Herd, by E. Z. Russell of the U. S. Department of Agriculture; and Swine Diseases, by W. W. Dimick of the Kentucky Station; a students' judging contest; and a carcass demonstration with particular reference to soft pork, by E. J. Wilford of the station.

Recent appointments include Carl W. Buckler as field agent and H. J. Hayes as assistant field agent in club work, Ernest N. Fergus as instructor in farm crops, Eugene L. Jackson as vegetable histologist in the station, Mary E. Lesh as specialist in clothing, Earl G. Welch as field agent in agricultural engineering, Kyle C. Westover as instructor in horticulture, and W. D. Iler as assistant chemist. L. E. Weaver, specialist in poultry, has resigned.

Maine Station.—Karl Sax, who has been conducting plant breeding work at the Riverbank Laboratories, Geneva, Ill., has been appointed biologist. He will have charge of the plant breeding work, and has entered upon his duties.

Walter Curtis has resigned as superintendent of the experiment farm at Presque Isle to enter commercial work, and has been succeeded by E. Raymond Ring, scientific aid in the station.

Maryland Station.—J. Roy Haag, assistant chemist in the Rhode Island Station, has been appointed assistant in soil investigations.

Massachusetts College.—Courses covering practically the entire summer are being arranged. The summer school, conducted in cooperation with the State Board of Education, will extend from June 28 to July 23, with courses in agriculture, horticulture, home economics, and related subjects. It will be paralleled by the School of Rural Social Science, designed particularly for graduate students, teachers, clergymen, and social workers. The School for Federal Soldiers, Sailors, and Marines will offer, in cooperation with the Federal Board for Vocational Education, courses from June 28 to August 28 in fruit growing, general horticulture, agronomy, floriculture, vegetable gardening, animal husbandry, gas engines, farm management, poultry, English, mathematics, and forge and shop practice, including numerous field courses.

In addition three regular and two special courses in agricultural education are to be offered from June 28 to August 6 for workers in agricultural teaching and administration under the vocational education acts. These courses will deal with general principles and methods of teaching, special methods in vocational agricultural teaching, professional improvement problems, supervision and administration of agricultural teaching, and vocational education, State and National.

Minnesota University and Station.—A new veterinary barn has been completed, 150 by 38 ft. Hollow clay blocks 12 in. in thickness are used for the construction, coated with cement and stucco on the outside and with cement and enamelled tiling within. There is also a vitrified brick silo. The building is to be used for veterinary clinical work.

Dr. Guy R. Bisby, assistant professor of plant pathology, has accepted an appointment as professor at the Manitoba Agricultural College beginning June 1. A. F. Thiel, assistant pathologist, has resigned to become associate pathologist in the Alabama Station beginning April 1. Norris K. Carnes, assistant professor of horse husbandry, and R. C. Dahlberg, analyst in charge of the seed laboratory, have resigned to engage in farming.

Nebraska University.—O. W. Sjogren, associate professor of agricultural engineering, has been made chairman of the department of agricultural engineering vice L. W. Chase, resigned to engage in commercial work.

Nevada Station.—The station is taking up experiments in the feeding of range ewes with the view to working out methods of carrying such ewes for an additional year prior to sale, and also methods of feeding ewes during the lambing period. It is expected that studies in the feeding of old range ewes, lambing ewes, and lambs will be made features of the station program for several years.

Cornell University and New York State Station.—An affiliation has been effected between the College of Agriculture at Ithaca and the State Station at Geneva, whereby each institution will maintain its present organization and functions but at the same time will work in a closer and more intimate relation. Under action taken by the board of trustees of the university the following members of the station staff have been appointed professors in the college of agriculture: Director W. H. Jordan and Dr. R. J. Anderson in animal nutrition, Dr. U. P. Hedrick in pomology, Drs. L. L. Van Slyke and R. S. Breed in dairy industry, F. C. Stewart in plant pathology, P. J. Parrott in entomology, and R. C. Collison in soil technology. Similarly the station board of control has appointed to the station staff, Dean A. R. Mann as agricultural economist, Dr. T. L. Lyon as chemist, Dr. R. A. Emerson as geneticist, Dr. W. H. Chandler as pomologist, W. A. Stocking as bacteriologist, Dr. L. A. Maynard as biochemist, G. W. Herrick as entomologist, and Dr. Donald Reddick as botanist.

No additional duties are prescribed under the new arrangement nor is any change in compensation involved. The advantages expected are chiefly in a closer relationship between the two institutions, which have hitherto been entirely separate. Opportunity will be afforded for cooperation and coordination in work, and for utilizing more fully the special facilities enjoyed by each institution. For instance, the State Station will be brought into closer relation with the extension organization at the university. The college of agriculture, in turn, may benefit in its instruction work by occasional lectures from the Geneva staff to advanced students.

Special advantages are anticipated in graduate work. Members of the State Station staff may now enroll as graduate students in the university and carry on their studies at Geneva under supervision, and eventually obtain a master's or doctor's degree from the university. Similarly, students at the university may be enabled to pursue certain investigational work at the State Station with direct academic credit, as if the work had been done at Ithaca.

North Carolina College and Station.—Ralph W. Green, of the Bureau of Markets of the U. S. Department of Agriculture, has recently been appointed editor for the college, station, and extension services. G. K. Middleton, assistant professor of agronomy, has resigned to take up agricultural work at Kaifeng, Honan Province, China.

Pennsylvania College and Station.—The resignations are noted of J. S. Gardner, assistant professor of vegetable gardening, effective April 1, and Carl G. Degen, assistant in agronomy, effective February 15.

Vermont University.—Miss Bertha Holden, extension specialist in home economics, has resigned to become assistant State leader at the Iowa College, effective April 1.

Wyoming University and Station.—J. L. Robinson, assistant professor of agronomy and assistant agronomist, resigned March 20 to become director of cooperative experiments in the farm crops department of the Iowa College.

Canadian Society of Technical Agriculturists.—The formation of this organization followed a reunion of the McGill University agricultural graduates in August, 1919. Among its objects are to bring about a closer cooperation between all workers engaged in the agricultural profession in Canada, and a closer cooperation and coordination of the Federal and Provincial administrations in agriculture; to aid in the employment of technically trained men by educating the public as to their usefulness and by attempting to establish adequate standards of remuneration; to serve as a medium for keeping employers in touch with competent eligibles; to provide a medium for the discussion of topics of interest to agricultural education, research, and extension; and ultimately to publish a journal in the interest of scientific agriculture.

Transfer of Work of British Rainfall Organization.—The British Rainfall Organization, founded in 1863 by the late G. J. Symons and subsequently directed in succession by Sowerby Wallis, H. R. Mill, and C. Salter, passed under the control of the Meteorological Office of Great Britain July 24, 1919. This organization had built up a very efficient cooperative force of about 5,000 voluntary observers in all parts of the British Isles. The results of the work of the organization have appeared monthly in *Symons' Meteorological Magazine* and annually in *British Rainfall.* The history of the organization and its work is given in full in *British Rainfall, 1909* and *1918*. It is expected that the Meteorological Office will keep the organization in the main intact and will continue to issue its two publications as heretofore.

The history of the development of the British Rainfall Organization furnishes a fine example of efficient management and scientific achievement, based on private initiative and limited financial support but with cordial and constant voluntary cooperation. The carefully collected, compiled, and verified rainfall data published annually in *British Rainfall* have furnished for the British Isles a remarkably complete and reliable historical record of a natural resource of vital importance to agricultrue. The annual reports have also contained records of percolation, evaporation, rainfall intensity, and other matters of great importance to engineers.

Institute of Nutrition in Holland.—An Institute of Nutrition is being established in Holland, under the directorship of Dr. E. C. van Leersum. It will deal with questions relating to food and human nutrition, and will be located in Amsterdam. Funds for a suitable building have been contributed by private sources, mainly representatives of the food industry, and an appropriation for maintenance has been made by the Government. Dr. van Leersum has spent several months in this country studying the work of leading food specialists, preparatory to organizing the new institute.

Agricultural Training for Returned Soldiers in British Columbia.—During the summer of 1919, the experimental farm at Agassiz, B. C., cooperating with the Vancouver Branch of the Soldier Settlement Board, assisted in training about 300 returned soldiers in practical farm work.

Quarters were provided and one or more instructors furnished, as well as the necessary equipment. The men were divided into six groups, each of which was employed in turn on work relating to general farming, horses, cattle, sheep, and swine, poultry, and land clearing. The work was done with the regular farm employees, supplemented by some instruction and one or two lectures a week. The six weeks' course was usually sufficient for the qualification for land settlement of candidates with previous farm experience, although generally some further experience on a privately owned farm was required. One of the chief merits of the course was said to be the opportunity afforded applicants to judge for themselves as to the actual merits and disadvantages of farming.

Training Disabled Soldiers and Sailors in Scotland.—The principal plan thus far attempted in Scotland for training disabled ex-service men for agriculture and related pursuits was begun in December, 1918, by the North of Scotland College of Agriculture on its estate at Craibstone in Aberdeen. This estate contains 761 acres, of which 140 acres are in the home farm, and is ultimately to be used for experimental and demonstration purposes. On the estate is a mansion house, which has been fitted up to accommodate over 40 men.

Practical training is provided in poultry management, horticulture, agriculture, beekeeping, forestry, and various handicrafts, together with lectures on soils, crops, live stock, seed testing, dairying, land surveying, poultry management, veterinary hygiene, horticulture, and forestry. The full course lasts 12 months, leading to a certificate on completion. Many of the students are prospective small holders, and others are seeking training along special lines suited to their disabilities.

New Journals.—*Journal of Mammalogy* is being published quarterly by the American Society of Mammalogists. The initial number contains, in addition to general notes, abstracts of recent literature, editorial comments, and by-laws and rules of the society, the following original articles: Bats from Mount Whitney, Cal., by G. M. Allen; Criteria for the Recognition of Species and Genera, by C. H. Merriam; The Mammals of Southeastern Washington, by L. R. Dice; Preliminary Notes on African Carnivora, by J. A. Allen; A New Subspecies of Beaver from North Dakota, by V. Bailey; Names of Some South American Mammals, by W. H. Osgood; and Notes on the Fox Squirrels of Southeastern United States, with Description of a New Form from Florida, by A. H. Howell.

Journal of Farm Economics is being issued by the American Farm Economic Association, formerly the American Farm Management Association, with L. A. Moorhouse, of the Office of Farm Management, U. S. Department of Agriculture, as editor in chief. The initial number contains the president's address and two papers presented at the Baltimore meeting in 1919, and brief notes.

The *Scientific American Supplement* has been converted into a monthly known as the *Scientific American Monthly*. One section of the new journal is to be devoted to the work of the National Research Council.

Zeitschrift für Gärungsphysiologie has been rechristened *Zeitschrift für technische Biologie*.

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Vol. 42. ABSTRACT NUMBER. No. 6.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

A chemical study of the ripening and pickling of California olives, R. W. HILTS and R. S. HOLLINGSHEAD (*U. S. Dept. Agr. Bul. 803* (*1920*), *pp. 24, pls. 5, figs. 10*).—Following a general description from the literature of olive culture and varieties in California, the olive picking season, changes in composition of the olive during ripening, and methods of pickling, this bulletin reports the results of an extensive investigation, undertaken in 1914 and continued through 1916, to determine whether immature olives were being pickled and sold as ripe, and also whether inferiority was being concealed by a process of coloring.

The plan of the investigation was to follow during successive seasons the development of the fruit on marked trees of different varieties and in different localities, recording changes of composition and physical characteristics, especially color, to determine possible differences between the immature and ripe fruit, and the relationship between color and maturity of the fruit. The laboratory methods of examination consisted of a physical examination of the samples as to color, flavor, ease of cleavage of the pulp from the pit, short diameter, number of olives per pound and percentage by weight of pits; and a chemical analysis of the flesh and of the pits. Different lots of olives were followed through the pickling process and examined in a like manner.

The results of the examination of the fresh olives showed that during the ripening, after the pit is formed, the pits remain practically constant while the growth in the flesh continues. This is accompanied by an increase in moisture content and in oil, the latter increasing at first rapidly and then more slowly. The color changes noted were from a green in September to a dark purple in December or January. The olives with the deeper colors were usually larger and heavier than the others from the same tree or grove and had the most oil and solids in the flesh. This was not always true, however, in comparing olives of the same variety from different groves or localities.

Data obtained on pickled olives showed that the process had little effect on the size of the olives or on the percentage of pits. The solids-not-oil showed a notable decrease from the fresh fruit, and the oil a corresponding increase, rising from about 60 per cent on the dry basis for fresh ripe fruit to 70 or 72 per cent for the same after pickling. The color changes during processing were very marked, green or yellow olives often forming a blacker final product than purple olives. The best color was developed in olives showing some red at first, the fully ripe purple olives tending to lose their color and become brown or tan.

The conclusion drawn from the results of this investigation is that the best index of maturity for olives, both fresh and pickled, is the percentage of oil in the fruit flesh. A minimum oil content of 17 per cent in the flesh is recommended as a tentative standard of maturity for Mission olives and other common varieties except the Manzanillo, for which a standard of 15 per cent is recommended, and the Ascolano and Sevillano. The latter have to be gathered when relatively immature and should not be sold under the designation "ripe." It is emphasized that the proposed standard must be applied with caution because of the great variations noted in the composition of olives of the same variety grown in different localities. It is thought, however, that the data presented will make possible the detection of fraud in the pickling and coloring of immature olives to simulate pickled ripe olives.

Lipolytic enzyms in olive oil, T. M. Rector (*Jour. Indus. and Engin. Chem., 12 (1920), No. 2, pp. 156–158, figs. 3*).—Experiments to determine the presence of a lipolytic enzym in olive oil and the effect of various factors upon this enzym are reported. The conclusion is drawn that a fat-hydrolyzing enzym is contained in chemically untreated, filtered olive oil, and that the activity of this enzym may be retained for a number of years, but is partially destroyed by heating at 75° C. for 15 minutes and totally destroyed by heating to 150° for the same length of time. Olive oil "foots" was found to contain a lipolytic antiferment, which was also destroyed by heat.

Studies on enzym action.—XVIII, The saccharogenic actions of potato juice, G. McGuire and K. G. Falk (*Jour. Gen. Physiol., 2 (1920), No. 3, pp. 215–227*).—In continuation of the studies on enzym action previously noted (E. S. R., 41, p. 202), the saccharogenic enzyms present in potato juice were studied, using the method developed by Sherman, Kendall, and Clark (E. S. R., 24, p. 122) of precipitating and weighing the cuprous oxid from an excess of Fehling's solution under definite conditions. The actions were followed upon the substances present in the juice and upon added sucrose, maltose, and soluble starch.

Sucrase and amylase were found to be present in the juice but no indication of a maltase was obtained. The optimum H-ion concentration for the action of the amylase was at pH 6 to 7, and for the sucrase at pH 4 to 5. The action of a yeast sucrase preparation upon the juice showed the presence of about 1 per cent of either sucrose or raffinose.

The rôle of pentose-fermenting bacteria in the production of corn silage, W. H. Peterson and E. B. Fred (*Jour. Biol. Chem., 41 (1920), No. 2, pp. 181–186*).—In this article a brief report is given of a study of the relationship to silage production of the pentose-fermenting bacteria previously noted as being present in large amounts in silage (E. S. R., 41, p. 614).

The results reported indicate that "the pentose-fermenting bacteria are capable of bringing about decided changes in raw or in sterilized corn tissue. When added to raw corn fodder, these organisms are able to compete with the fermentation processes which normally occur. In sterilized silage the pentose fermenters develop rapidly and produce the substances commonly found in good silage; viz, acetic acid, lactic acid, ethyl alcohol, and carbon dioxid. From the standpoint of temperature, oxygen supply, and fermentable compounds, silage offers a suitable medium for the growth of the pentose fermenters. The authors feel that the results indicate that these bacteria play an important part in the formation of corn silage."

The influence of ester transposition in the determination of saponification numbers, A. M. Pardee and E. E. Reid (*Jour. Indus. and Engin. Chem., 12 (1920), No. 2, pp. 129–133*).—The influence of alcoholysis of esters, or ester transposition, upon saponification is demonstrated by quantitative saponification experiments in which different alcohols and esters were used. Normal butyl alcohol was found to offer many advantages over ethyl alcohol as the medium in which to carry on saponifications.

The heptoses from gulose and some of their derivatives, F. B. La Forge (*Jour. Biol. Chem., 41 (1920), No. 2, pp. 251–256*).—This contribution from the Bureau of Chemistry, U. S. Department of Agriculture, describes the preparation from gulose of two new heptoses, α-δ-galaheptose and β-guloheptose. The former is sparingly soluble in water and alcohol, from which it crystallizes in rosettes of long needles. The latter has been isolated only in the form of a sirup. Several derivatives of these heptoses are also described, and the identity of one of them with β-δ-galaheptitol is proved.

Note on the oxidation of sugars by mercuric acetate in the presence of ammonia, T. Ingvaldsen and L. Bauman (*Jour. Biol. Chem., 41 (1920), No. 2, pp. 147, 148*).—The authors state that ammonium gluconate and ammonium galactonate may be obtained in a 50 per cent yield by the action of mercuric acetate on glucose or galactose in the presence of ammonia. Mannose and lactose, which are also oxidized by this method, do not interfere with the reaction as the ammonium salts of their respective acids do not crystallize.

In the preparation of ammonium gluconate 10 gm. of glucose dissolved in 100 cc. of water is treated with 25 gm. of mercuric acetate and 15 cc. of concentrated ammonia. The solution is kept at room temperature over night, after which it is heated on the water bath for 12 hours, saturated with hydrogen sulphid, filtered, purified with bone black, and evaporated in a partial vacuum. On treating the remaining sirup with alcohol, ammonium gluconate crystallizes as thin hexagonal plates melting at 155 to 157° C. (uncorrected). Ammonium galactonate when prepared by the same method crystallizes in small needles melting at 155 to 157°.

Alkali fusions.—I, The fusion of sodium p-cymene sulphonate with sodium hydroxid for the production of carvacrol, H. D. Gibbs and M. Phillips (*Jour. Indus. and Engin. Chem., 12 (1920), No. 2, pp. 145–149, figs. 5*).—This contribution from the Bureau of Chemistry, U. S. Department of Agriculture, contains a description with diagram of an apparatus for alkali fusion in which the heating is conducted in an autoclave instead of a fire-heated open kettle, and reports the results of an investigation of the reaction between sodium *p*-cymene sulphonate and sodium hydroxid involved in the production of carvacrol.

An increase of about 23 per cent in the yield of carvacrol over the best yield reported by Hixson and McKee (E. S. R., 40, p. 110) with the open-kettle method was obtained. Several advantages in the use of an autoclave for caustic fusions are pointed out.

Melting point determination with electrical heating, S. L. Malowan (*Ztschr. Angew. Chem., 32 (1919), No. 4, Aufsatzt., p. 16, fig. 1*).—An apparatus for melting-point determinations is described in which an electric crucible furnace is used as the source of heat, thus rendering the determinations much more rapid and less liable to accident than when a sulphuric acid or glycerin bath heated over a gas flame is used.

The melting-point apparatus consists of two small glass test tubes placed one within the other in such a way as to inclose an air space around and below the inner tube. The inner tube, containing the sample, is closed with a two-hole stopper, one hole containing the thermometer and the other a small bent glass tube. A fine wire passing around the rubber stopper and thermometer fastens the inner tube to the outer, which is attached to an adjustable support by means of which the apparatus may be lowered into the furnace.

The effect of chlorids on the nitrometer determination of nitrates, M. T. SANDERS (*Jour. Indus. and Engin. Chem., 12 (1920), No. 2, pp. 169, 170, fig. 1*).—It was found impossible to obtain results accurate to 0.1 per cent in the nitrometer determination of nitrates if the sample contained more than from 15 to 17 per cent of sodium chlorid on a dry basis.

The formaldehyde method for determining ammonium nitrate, J. T. GRISSOM (*Jour. Indus. and Engin. Chem., 12 (1920), No. 2, pp. 172, 173*).—An examination of various methods of determining ammonium nitrate is reported, the results of which indicate that the rapid formaldehyde method involving direct titration with N/3 NaOH gives results agreeing most closely with the longer Kjeldahl method but which are consistently about 0.25 per cent low. It is thought that this method may be used for accurate work if a suitable correction is made by adding to the results a factor obtained by running a Kjeldahl on a representative sample.

On the distillation of ammonia, B. S. DAVISSON (*Jour. Indus. and Engin. Chem., 12 (1920), No. 2, pp. 176, 177*).—It is recommended that the distilling apparatus previously described in contributions from the Ohio Experiment Station on nitrogen methods, i. e., the all-glass apparatus of Allen and Davisson (E. S. R., 40, p. 609), or block-tin condensers with the new scrubber and adapter described by the author (E. S. R., 40, p. 806), be used in the procedure for determining nitric nitrogen (E. S. R., 40, p. 711). The cooled condenser is used for the first 20 minutes of moderate boiling, after which it is drained and the boiling continued more rapidly for 20 minutes longer, when the receiver is removed, cooled, and titrated.

By this method of distillation the volume of solution in the receiving flask is kept small, and at the same time the solution in the distilling flask is not greatly reduced in volume.

The volumetric phosphoric acid determination of Pincus for the indirect determination of magnesium, J. W. SPRINGER (*Ztschr. Angew. Chem., 32 (1919), No. 48, Aufsatzt., p. 192*).—The author suggests the application of the method of Pincus for the determination of phosphates by precipitation with uranium acetate to the indirect determination of magnesium. The magnesium salt is precipitated as magnesium ammonium phosphate, and the precipitate is heated to boiling with a dilute solution of ammonium acetate and titrated, while boiling, with uranium acetate solution until one drop reacts with powdered potassium ferrocyanid.

The method is said to be more rapid and quite as accurate as the gravimetric method.

Substitutes for phenolphthalein and methyl orange in the titration of fixed and half-bound CO_2, F. M. SCALES (*Science, n. ser., 51 (1920), No. 1313, p. 214*).—The indicator recommended as a substitute for phenolphthalein in the determination of sodium carbonate in the presence of the hydroxid is thymol blue (thymol sulphonphthalein), which is prepared by dissolving 0.01 gm. of the reagent in 4.3 cc. of N/20 NaOH and making the volume up to 250 cc. with distilled water. The substitute for methyl orange is bromphenol blue (tetrabromphenol sulphonphthalein), which is prepared in the same way except that 3 cc. of NaOH is required.

The two indicators have the same color changes. Six drops of the thymol blue in 75 cc. of solution gives a deep blue color in the presence of both the hydroxid and carbonate, changing to a muddy green when sufficient acid has been added to neutralize the hydroxid and convert the carbonate into bicarbonate, and to a clear lemon-yellow color with a slight excess of acid. The addition of 3 drops of bromphenol blue changes the color of the solution again to a deep blue which remains until the bicarbonate has been completely neutralized, the color then changing as before through a muddy green to a clear yellow.

A study of the nephelometric values of cholesterol and the higher fatty acids, II, F. A. CSONKA (*Jour. Biol. Chem., 41 (1920), No. 2, pp. 243–249, fig. 1*).—In this paper, which is in continuation of the study of factors governing the nephelometric value of fatty acids and cholesterol previously noted (E. S. R., 39, p. 311), a study is reported of the influence upon this determination of certain factors in their relation to saponification. Oleic acid, cholesterol, and olive oil were used both unmodified and saponified. The technique was varied slightly in different tests, and in some gelatin was added to observe the effect of a protective colloid.

The nephelometric value was found to vary with the conditions under which turbidity was produced, and to be altered by the saponification process. This is thought to be a further proof of the necessity in obtaining nephelometric values of treating the standard in the same manner as the unknown.

Method of preparing phloroglucinol reagent for the Kreis test, H. W. DIXON (*Jour. Indus. and Engin. Chem., 12 (1920), No. 2, p. 174*).—A method of preparing the Kreis reagent for use in detecting rancidity in fats as recommended by Kerr (E. S. R., 39, p. 313) is described, which depends upon the synthesis of phloroglucinol from resorcinol.

The method consists briefly in dissolving 100 gm. of sodium hydroxid in 40 cc. of water by heating slowly in an iron or nickel container, stirring in after sufficient cooling 15 gm. of resorcinol, and heating with exclusion of air for 2 or 3 hours on a sand bath. The melt is then cooled, dissolved in 500 cc. of water, transferred to a beaker, cooled in ice, and acidified by cautiously adding concentrated hydrochloric acid. The phloroglucinol is extracted from the solution by shaking with 100 cc. portions of ether in a separating funnel. The ether extract, filtered through charcoal, serves as the stock solution from which the Kreis reagent can be prepared, when desired, by dilution with ether until it gives a good reaction with a strongly rancid fat.

The electrometric titration of plant juices, A. R. C. HAAS (*Soil Sci., 7 (1919), No. 6, pp. 487–491, fig. 1*).—The author suggests the use of electrometric methods for determining the acidity of plant juices, and describes the construction and operation of a gas-chain apparatus for such determinations, which is essentially of the form described by Hildebrand.[1] Data obtained with the use of this apparatus on the juice of soy bean tops and rhubarb plants are given, including actual acidity in terms of pH of the extracted juice and of the same juice after the addition of varying amounts of alkali. The data indicate the presence of greater quantities of buffer substances in the juice of the rhubarb than of the soy bean tops, and a higher actual acidity of the rhubarb juice.

Suggested applications of the method include the determination of the buffer processes, the acid and alkali reserve, and the actual and total acidities of plant juices, and studies of the relations of the nutrients in the soil and of the symbiotic bacteria to the actual and total acidities of plant juices.

Detection of hydrogen peroxid in pasteurized milk by means of tincture of guaiacum, M. FOUASSIER (*Ann. Chim. Analyt., 2. ser., 2 (1920), No. 1, pp. 9–11*).—The author recommends the use of freshly macerated potato as a source of peroxidase in the guaiacic reaction as applied to pasteurized milk.

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[1] Jour. Amer. Chem. Soc., 35 (1913), No. 7, pp. 847–871, figs. 15.

Direct quantitative determination of potassium and sodium in small quantities of blood, B. KRAMER (*Jour. Biol. Chem.,* 41 (1920), *No. 2, pp. 263–274*).—The method of determining potassium is similar to that of Drushel (E. S. R., 19, p. 808) with the exception that, instead of concentrating the material after the addition of the sodium cobalti-nitrite reagent, the blood (1 cc.), plasma (3 to 5 cc.), or serum (3 to 5 cc.) is first dried completely and ashed. The ash is then dissolved in 0.5 cc. of water with the aid of 1 or 2 drops of glacial acetic acid, and from 0.5 to 1 cc. of the sodium cobalti-nitrite reagent is added drop by drop with stirring. After filtering through a Gooch crucible and washing with a small amount of water, the precipitate is transferred to a beaker, heated on a steam bath with an excess (25 cc.) of N/100 potassium permanganate and 5 cc. of 25 per cent sulphuric acid, decolorized with N/100 oxalic acid, and finally titrated back to a permanent pink with the permanganate solution.

The sodium determination depends upon its precipitation from a solution of the ashed blood by potassium pyroantimonate in the presence of alcohol.

The technique involved in both methods is described in detail. One important feature is the method of ashing. By placing the blood in a platinum crucible which rests on several pieces of porcelain in a flat-bottomed quartz dish, the heating may be so controlled that there is no loss of salts through volatilization. The methods are said to be accurate usually to within 3 per cent of the theory.

Note on a short modification of the official chlorin method for feeds, feces, and urine, J. O. HALVERSON and E. B. WELLS (*Jour. Biol. Chem.,* 41 (1920), *No. 2, pp. 205–208*).—The authors, at the Ohio Experiment Station, have devised a modification of the official Volhard chlorin method as refined by Rappleye (E. S. R., 39, p. 807). This is said to be much more accurate for the estimation of such small quantities of chlorin as are likely to be present in feeds, feces, and swine urine.

The modification consists in eliminating the step of washing excess silver nitrate from the silver chlorid precipitate, and substituting titration of an aliquot of the clear filtrate directly after filtering off the silver chlorid precipitate. It is stated that "by this method clear solutions of small definite volumes for titration are obtained, thus avoiding the frequent turbidity encountered and the tedious washing of the silver chlorid precipitate free from the excess silver nitrate."

Comparative results are given of chlorin determinations in corn, linseed oil meal, wheat middlings, swine feces, and swine urine by the Official Method and the proposed modification.

A new shaking-out method for the determination of fat in feces, G. SONNTAG (*Arb. K. Gsndhtsamt.,* 51 (1918), *No. 1, pp. 25–41, fig. 1*).—The details of the method are as follows:

From 2 to 3 gm. of air-dried, powdered feces in a 150 cc. Erlenmeyer flask is moistened with from 2 to 3 cc. of a mixture of 4 parts of petroleum ether and 1 part acetic acid and allowed to stand for 5 minutes, after which about 50 cc. of a cooled mixture of equal parts of sulphuric acid and water is added. After another 5 minutes the flask is covered with a watch crystal and heated on a water bath for 8 minutes with frequent shaking. The digestion on the water bath is continued with 3 per cent hydrogen peroxid, 10 cc. being first added, followed at 10-minute intervals by successive 5 cc. portions until the mixture clears. This requires generally from 15 to 25 cc. of hydrogen peroxid. The mixture is diluted to 80 cc. with water, cooled, and, after the addition of 20 cc. of 96 per cent alcohol, is shaken for a few minutes with 100 cc. of petroleum ether (boiling point 30 to 60° C.) in a shaking machine. After the ether layer has been transferred to a weighed flask, the shaking-out process is continued with successive portions of petroleum ether, after which the solvent is distilled off from the combined extracts and the fat dried and weighed.

The method is recommended as extracting the fat more completely and quickly than the Soxhlet method, although having the disadvantage of requiring more manipulation.

Sugar sirup from home-grown sugar beets, J. M. Ort and J. R. Withrow (*Jour. Indus. and Engin. Chem., 12 (1920), No. 1, pp. 154–156*).—The results are reported of attempted modifications of various published methods, particularly the process described by Townsend and Gore (E. S. R., 37, p. 511), for making a sirup from home-grown sugar beets, the object being to render the product more palatable and free from beet flavor.

It was found that the peculiar beet flavor can be practically eliminated from the sirup by pròper attention to topping the beets, excluding all green portions, and by a brief preliminary extraction. It is thought that the flavor may be due partly to immaturity, in which case preliminary storage of the beets will improve it. Enamel and aluminum utensils were found to be more satisfactory than copper for boiling the sirup.

Home curing of meats: Pork (*Purdue Agr., 14 (1920), No. 5, pp. 256, 258, 260, 280, 282*).—This article gives general directions for preserving pork, including the preparation of plain salt pork, pickled hams and bacon in brine, head cheese, pickled pigs' feet, lard, and sausage.

New methods of food dehydration, K. G. Falk (*Amer. Food Jour., 15 (1920), No. 2, pp. 15–17*).—This paper consists chiefly of a comparison of the value of different methods of preserving food materials, with particular reference to the factors safety of product, food hormones, transportation facilities, palatability, and economic considerations. The methods of preservation considered are refrigeration, canning, sun drying, air-process drying, and the vacuum drying process developed by the author and collaborators (E. S. R., 41, p. 807).

While the other processes are shown to be unsatisfactory with respect to certain of the factors mentioned, the vacuum process is considered by the author to give satisfactory results throughout, and to offer entirely new possibilities, especially with meat and fish.

The influence of the method of manufacture on the use of casein in glue making, S. Butterman (*Jour. Indus. and Engin. Chem., 12 (1920), No. 2, pp. 141–144, figs. 2*).—This contribution from the U. S. Forest Products Laboratory, Madison, Wis., continues the investigation of commercial caseins, the first part of which was reported by Browne (E. S. R., 42, p. 111), by a study of the ash content of commercial caseins in its relation to the water requirement for the manufacture of water-resistant glue.

The amount of water required to give a glue of medium viscosity was found to be a linear function of the ash content of the casein. "By making a determination of the ash content of a given sample of casein, it is therefore possible to tell at once the proper proportion of the ingredients required to mix it into a satisfactory glue, regardless of the method by which the casein has been prepared. It is therefore possible to use casein made by any of the commercial methods for making casein water-resistant glue and still obtain uniform results."

A colloidal method for increasing the volume of adhesive water-glass, J. D. Malcolmson (*Jour. Indus. and Engin. Chem., 12 (1920), No. 2, pp. 174–176, figs. 2*).—In connection with a threatened shortage of commercial water-glass in the box-board industry, an investigation of the problem of increasing the volume of the water-glass without injuring its essential properties led to the discovery that by diluting the water-glass with brine about two-thirds saturated it was possible to increase the volume of the solution by 25 per cent without lowering the original viscosity or detracting from any of the desirable properties of the water-glass. Small increases in the concentration of the brine beyond this point were found to cause proportionately greater increases in the viscosity with final loss of all fluidity.

Testing the mildew resistance of textiles, B. S. Levine and F. P. Veitch (*Jour. Indus. and Engin. Chem., 12 (1920), No. 2, pp. 139–141*).—Existing methods for testing the mildew resistance of fabrics are outlined and discussed, and a laboratory method devised and used in the Bureau of Chemistry, U. S. Department of Agriculture, is described.

The method consists briefly in exposing 3.5-in. samples of the material to running water for 2 days to remove from the fabric as much as possible of the water-soluble, germicidal, fungicidal, and fermentable material, and then incubating the samples, from which excess water has been removed, at a temperature of from 20 to 25° C. for from 7 to 10 days in Petri dishes containing plain agar jelly. If the plates show a well developed growth at the end of this time the test is discontinued, otherwise the discs are inoculated with stock cultures of Alternaria, Cladosporium, and a pink Mucor, and further incubated for 3 or 4 weeks. During this period weekly examinations of the plates are made macroscopically and with the aid of the binocular microscope.

A rating on a scale of ten and a system of nomenclature have been developed to standardize the test. A comparison of the results of the laboratory tests on pieces of untreated and treated cloth with results of exposure tests for a period of nearly a year is reported which indicates that the method can apparently be relied upon, especially in distinguishing between resistant and nonresistant treatments.

The use of hydrogenated oils in the manufacture of tin plate, W. D. Collins and W. F. Clarke (*Jour. Indus. and Engin. Chem., 12 (1920), No. 2, pp. 149–152*).—An investigation conducted by the Bureau of Chemistry, U. S. Department of Agriculture, of possible substitutes for palm oil in the manufacture of tin plate is reported, which resulted in the discovery that palm oil could be replaced by hydrogenated cottonseed oil with no loss in operating efficiency.

In a commercial test continued for 12 weeks a tin pot using hydrogenated cottonseed oil operated somewhat better than with palm oil and with a distinctly lower consumption of oil. There was no appreciable saving of tin. Heating experiments also showed that a hydrogenated fish oil might be obtained which would be satisfactory for use in tin pots, though hardened to a less degree than was found necessary with cottonseed oil. At present the cost of production of the latter would probably balance the advantages to be obtained in its use.

METEOROLOGY.

The climate of Kansas, S. D. Flora (*Bien. Rpt. Kans. State Bd. Agr., 21 (1917–18), pp. 335–348, figs. 5*).—The climate of Kansas is described as typically continental, "characterized by extremes of temperatures, great variations in the seasonal rainfall, much sunshine, and dry, bracing air, with good wind movement."

The average annual temperature ranges from 58° F. in the southeastern counties to 51° in the northwestern. with a mean of 54° for the State as a whole. The lowest temperature recorded in the State is 40° below zero, the highest 116°. A mean maximum temperature of 107° was recorded at Clay Center during August, 1913.

Precipitation decreases with remarkable regularity from 42 in. in the southeastern counties to a little more than 15 in. at the Colorado line. "The northern half of the State receives practically the same amount as the southern, except that the northeast quarter receives slightly less than the southeast." The average annual snowfall ranges from 11 in. in the extreme south-central counties to 2 ft. in scattered localities farther north.

"Damage by drought in Kansas usually occurs during July and August, and is due largely to the high rate of evaporation caused by an excessive amount of sunshine and hot, drying winds. Records compiled for the 20-year period ending with 1914 show that in the eastern part periods of 30 days without more than 0.25 in. of rain within 24 hours have occurred during the growing season—April to September, inclusive—on an average of about one year in two, which is the average for other important corn-growing States, but in the western part rainfall is inclined to be irregular, as to both time and place of occurrence, and 33 such periods have occurred in the 20-year period. . . .

"The rainfall of eastern Kansas during the warm season is normally heavier than in almost any other part of the country, and exceptionally heavy rains falling at this time have been the cause of all the serious floods Kansas has experienced. . . . The drainage areas of the principal streams are immense in comparison with the size of the river channels, and continued heavy rains over large areas, which are most liable to occur in May and June, often start disastrous overflows, as the banks are generally low and the courses of the streams tortuous. As a rule these floods are caused by rains east of the center of the State. . . .

"The winds over the eastern third [of the State] are not noticeably higher than those that blow over other States between Kansas and the Atlantic, while the western third is one of the windiest inland localities in the country." Blizzards are exceedingly rare. "The most damaging winds are the 'hot winds.' These usually occur during a prolonged heated period and are commonly described as being 'like the wind from a furnace.' They occur with shade temperatures of from 100 to 116, often have a high velocity, and cause great injury to growing crops, in extreme cases having been known to kill the bark and foliage on the south side of trees. They are of very irregular occurrence." Tornadoes occur practically every year and often several times during the year, but the territory devastated is comparatively small. The months of greatest frequency are April, May, and June.

"The growing season is sufficiently long to give ample time for the development and maturing of the principal crops of the State, but sometimes an extended period of warm weather in March and April, especially March, will force vegetation so far ahead of the season that great damage results from a late frost in May. This applies especially to fruit and early vegetables. Only in rare instances do the first killing frosts of autumn occur early enough to cause serious damage. The average date of the last killing frost in spring ranges from April 7 in the extreme southeast to the first week in May in the northwest, and killing frosts have been known to occur over nearly all the western and north-central counties as late as May 27. The average date of the first killing frost in autumn ranges from the first week in October in the northwestern counties to October 22 in the southeastern counties, and killing frosts have occurred in September in practically all parts. On account of the extreme dryness of the air in the western section instances often occur where the temperature falls to freezing, or even a few degrees lower, without the deposit of frost or any damage to the most tender vegetation."

The percentage of sunshine is high. This "makes for the rapid growth of crops," but is also "one of the reasons why droughts are so severely felt."

Discussing some popular fallacies regarding Kansas weather, it is shown that the recorded evidence does not indicate that the climate is changing.

Ohio weather for 1918, W. H. ALEXANDER and C. A. PATTON (*Ohio Sta. Bul. 337 (1918), pp. 649–737, figs. 63*).—Tables showing temperature and rainfall for the entire State in comparison with similar data recorded at the experiment station at Wooster are supplemented by a series of diagrammatic maps showing the comparative weather conditions for the various sections of the State.

The mean temperature for the year at the station was 50.5° F.; for the State, 51.5°. The highest temperature at the station was 105°, August 6; for the State, 110°, August 6. The lowest temperature at the station was —19°, January 20; for the State, —28°, January 20. The annual rainfall at the station was 33.75 in.; for the State, 36.54. The number of rainy days at the station was 130; for the State, 117. The prevailing direction of the wind was southwest at the station and in the State at large.

The year was distinguished by both the coldest and hottest weather on record at many stations in Ohio. "The cold wave that overspread the State on January 11–12 and the hot wave on August 5–6 were unprecedented in severity. The former was but an incident in connection with the cold weather that set in on December 8, 1917, and continued with remarkable persistence up to and including February 5, 1918, while the latter came on with unusual suddenness and lasted for about 11 days."

The period free from killing frosts in 1918 extended from May 2 to October 1 at the station; the temperature fell below zero 12 times during the year.

The weather of Scotland in 1918, A. WATT (*Trans. Highland and Agr. Soc. Scot., 5. ser., 31 (1919), pp. 310–321*).—"This report consists of (1) a general description of the weather over the Scottish area from month to month; (2) a selection of rainfall returns, in which each county in Scotland is represented by one or more stations."

[Rainfall of Dominica, 1893–1918], F. WATTS (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Dominica, 1918–19, pp. 30–33, figs. 2*).—The monthly and annual rainfall at the Botanic Gardens, Dominica, from 1893 to 1918, inclusive, is shown in tables and diagrams. The monthly and annual rainfall at a number of other places in Dominica during 1918 is also tabulated.

Rainfall, sugar production, and froghopper blight in Trinidad, C. B. WILLIAMS (*Bul. Dept. Agr. Trinidad and Tobago, 18 (1919), No. 3, pp. 153–161, figs. 11*).—A number of diagrams showing the relation between rainfall, blight due to the froghopper (*Tomaspis saccharina*), and sugar production are given and discussed.

"Alternation of wet and dry periods during the growth of the sugar cane is shown to be an important factor in determining the prevalence of 'blight.' A long dry season, followed by unusually heavy rains in June or July, is frequently connected with widespread blight. The most important climatic condition, however, appears to be the severity of the 'Indian Summer,' a dry period in September or October. A severe Indian Summer is a general condition both of localities damaged by blight in one year and of years of widespread blight in one locality. Blight could be reduced, irrespective of its first cause, by getting the field in a condition to lessen the effects of excessive moisture and drought. Better drainage is the obvious agricultural method that will help to bring about these conditions."

Phenological observations, 1918 (*Arb. Landw. Kammer Hesse, No. 24 (1919), pp. 3–26*).—Observations by uniform methods, which are described, on various native trees and other plants, fruits, and field crops, the latter including rye, wheat, barley, and oats, at 88 stations, 79 in Germany, 5 in Austria, 1 in Hungary, 2 in Belgium, and 1 in Holland, are summarized.

Recent phenological literature (*Arb. Landw. Kammer Hesse, No. 24 (1919), pp. 27, 28*).—An annotated list of 14 recent contributions to phenological literature is given.

Selection of plants with reference to meteorological conditions, G. Azzi (*Coltivatore, 66 (1920), Nos. 1, pp. 7–9; 2, pp. 41–43*).—This is an exposition of methods of investigation followed in the stations of agricultural geography and meteorology organized in Italy by the author and others. The article deals with the critical period of plants, phenological enivronment, and correlation of meteorological elements with plant growth, with special reference to the determination of the reduction of yield of wheat caused by unfavorable meteorological conditions, and the selection and adaptation of this crop to the meteorological environment.

Do phenological conditions furnish a basis for determining the amount of seed of cereals to use? L. Hiltner (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 16 (1918), No. 11–12; 17 (1919), No. 1–2, pp. 5–15; abs. in Arb. Landw. Kammer Hesse, No. 24 (1919), pp. 35, 36*).—It was found in experiments in seeding varying amounts of rye that regions having the earlier blooming dates, and hence the better phenological conditions, uniformly required much less seed than those having later blooming dates and less favorable conditions.

The influence of meteorological phenomena on the culture of wheat, F. E. de A. Figueiredo (*Bol. Assoc. Cent Agr. Portuguesa, 21 (1919), No. 8, pp. 251–264, figs. 9*).—This article attempts to correlate temperature and precipitation with production and quality of wheat grown on the experimental field of agricultural meteorology at the Superior Institute of Agronomy of Portugal during 1914 to 1917. Similar correlations are also attempted for other parts of Portugal and different wheat growing regions of Europe.

Correlation of wind flow and temperature with evaporation, C. A. Shull (*Plant World, 22 (1919), No. 7, pp. 210–215, fig. 1*).—This article presents a correlation of observations on wind movement, temperature, and evaporation on Mount Oread, near Lawrence, Kans. This indicates that temperature is the predominant influence in the control of evaporation, and that wind movement is a secondary influence.

Optics of the air, W. J. Humphreys (*Jour. Franklin Inst., 188 (1919), Nos. 4, pp. 433–488; 5, pp. 607–674, figs. 54*).—Continuing a previous series of articles on the physics of the air (E. S. R., 39, p. 616), the author deals in detail with various optical phenomena of the air such as mirages, rainbows, halos, coronas, azured sky, twilight glow, etc., from the standpoint of their physical causes. The work of Pernter and Exner is largely, but by no means exclusively, drawn upon in the discussion.

SOILS—FERTILIZERS.

Soils and manures in New Zealand, L. J. Wild (*Auckland, New Zeal., and London: Whitcombe & Tombs, Ltd., [1919], pp. 134, figs. 11*).—This is a popular treatise dealing with the general principles regarding the management of soils and the use of manures, with particular reference to New Zealand conditions. The following chapters are included: The abode of the plant, plant nutrients in the soil, soil fertility and the principles of manuring, the improvement of fertility, the soils of New Zealand, how to find the manurial requirements of a soil, manures, miscellaneous fertilizers, the valuation of manures, and manurial requirements of various crops. A chapter is included giving a general description of the various soils to be found in New Zealand. These include alluvial, swamp, volcanic, limestone, blue calcareous clay, uncultivated, and abnormal soils. The abnormal types include acid, arid, and stony heavy soils. The cultivated soils of New Zealand vary from medium light to medium heavy in texture.

Farming marsh soils, A. R. WHITSON and H. W. ULLSPERGER (*Wisconsin Sta. Bul. 309* (*1919*), *pp. 32, figs. 7*).—This is a popular discussion based on different experiments in Wisconsin, giving general information on the farming and proper management of marsh soils in the State.

The steps necessary to reclaim marsh soils are drainage, breaking and preparing the seed bed, proper fertilization, and crop selection. The marsh soils of the State are of three types—peat, muck, and so-called marsh-border soils, which vary in organic-matter content from 5 to 15 per cent. It is noted that the nitrogen content of all marsh soils is very high as compared with that of upland soils, peat being exceptionally rich in nitrogen. The peat soils are, as a rule, deficient in potassium and phosphorus. Mucks are better supplied with these two elements, although the potassium content is low in comparison with upland clay or silt loam. The marsh-border soils have been found to be well supplied with both potassium and phosphorus, as well as with nitrogen, and are considered to have high cropping possibilities. In the peat and muck soils potassium is a common factor limiting crop yields.

Experiments also indicate that not only is there a great variation in the total amount of phosphorus present in the marsh soils of the State but that there is even greater variation in availability of the phosphorus. Acidity has been found to be one of the most important factors influencing the availability of phosphorus in these soils, it being found that acid soils are generally low in available phosphorus. Acid phosphate is considered to be the safest form of phosphatic fertilizer to use on these soils, although it is considered probable that raw rock phosphate may prove to be cheaper in the long run.

It is pointed out that a wide variety of crops can be grown on Wisconsin marsh soils, but that crops should be adapted to the marsh soils in different sections of the State. Crop rotations are considered desirable on these soils. It is stated that dairy farming, truck farming, stock raising, or combinations of the three, are the best types of farming to follow on marsh soils, but that Wisconsin marshes are not adapted to grain farming.

Guide for moor cultivation, H. PAULIG (*Leitfaden der Moorkultivierung. Hanover: M. & H. Schaper, 1918, pp.* [*IV*]+*74, pls. 6*).—This book deals with the origin and characteristics of German moors, moor soils, and heather soils, and with the reclamation, treatment, and cultivation of both upland and lowland moors, taking up especially questions of drainage, fertilization, and planting.

A soil survey of the Kistna Delta, W. H. HARRISON, M. R. RAMASWAMI SIVAN, and B. VISWANATH (*Dept. Agr. Madras Bul. 75* (*1918*), *pp. 6, pls. 10*).—This survey reports analyses of 138 samples of soil representative of the soils of an area in Madras bounded by the Godavari River on the north, the Bay of Bengal on the east, the Kistna River on the south, and the Ellore Canal on the west.

It is shown that the nitrogen content of these soils is low and the addition of special nitrogenous fertilizers is considered advantageous. Only one-fourth of the soils of the delta are in immediate need of phosphatic manures. The silt of the Kistna and Godavari Rivers is rich in lime and magnesia and in total potash and phosphoric acid, and the conservation of the river silt is considered to be very important. There is said to be no need for potash fertilizers nor for liming, with some few exceptions. The infertility of isolated soils is ascribed more to defective drainage than to lack of fertility constituents.

Papers on soil denudation (*Indian Tea Assoc. [Pamphlet], 2 (1917), pp. [II]+XXVIII+95, pls. 6, figs. 13*).—Following an introduction by G. D. Hope, a collection of papers are presented explaining the views of specialists in Indian agriculture on the subject of soil erosion and its prevention, surface drainage, and the conservation of soil moisture, all of which are considered to be of the utmost importance in the tea-growing industry of northeast India, and dealing with the subject of soil aeration and the control of rain water and soil moisture generally.

Soil erosion and conservation, I–IV, T. R. Sim (*So. African Jour. Indus., 2 (1919), Nos. 8, pp. 715–724; 9, pp. 867–881; 10, pp. 962–968; 11, pp. 1034–1042*).—This report, based on extensive operations in South Africa, deals with the different factors causing soil erosion and methods of prevention and cure.

On the basis of these observations, it is recommended that grass burning be discouraged everywhere and placed under restrictions, and that the harvesting and consequent destruction of bush and forest be regularly followed by reforestation, preferably with trees which rapidly return a much larger revenue and meet present and prospective timber requirements. It is further recommended that the Government formulate and carry out a Government afforestation scheme commensurate with the climatic and economic requirements of South Africa, and that private owners be encouraged and assisted by the Government to accelerate extensive development of this nature. It is also suggested that in agricultural operations contouring be practiced more regularly, and regarded as a necessity in the prevention of soil erosion.

Experiments on evaporation from soils, G. de Angelis d'Ossat (*Staz. Sper. Agr. Ital., 51 (1918), No. 1–2, pp. 41–55, figs. 2*).—Experiments extending over a period of 111 days, from May 11 to August 31, on evaporation from agricultural soils at a depth of from 20 to 30 cm. (7.4 to 11.7 in.), are reported. The water capacity of this soil was 32.42 per cent by weight and 44 per cent by volume.

The observations over the first 47 days, up until June 27 and previous to cutting the grain crop, showed that the subsurface soil at first contained more moisture than the cultivated surface soil, but during the middle of the period the surface soil contained more moisture. At the end of the period the subsurface soil again contained more moisture than the surface soil. From June 27 until the end of the experimental period it was found that the moisture content of the cultivated surface soil was constantly superior to that in the subsurface soil. The surface soil contained an average of 13.095 per cent and the subsurface soil an average of 9.385 per cent, there being an average difference in favor of the surface soil of 3.71 per cent.

These results are taken to indicate the extreme importance of proper surface cultivation on soils in semiarid regions. During the rainy periods such cultivation should be employed as to permit the penetration of a maximum possible quantity of water into the subsurface. During dry periods such cultivation should be used as to impede evaporation from the subsurface through the surface soils.

Further experiments were conducted with sand and clay soils to determine the velocity of evaporation. The apparatus used is described and illustrated. It was found that the clay evaporated more water than the sand, and that the daily evaporation from the clay was constantly greater than from the sand.

Influence of cultivation on the conservation of water in the soil, J. Mendes de Godoy (*Escola Agr. "Luiz de Queiroz," Piracicaba, Brazil, Ser. Agr., Bol. 4 (1919), pp. 21, figs. 10*).—The studies of others bearing on the subject are reviewed, particularly those of American experimenters, and studies on the retention and conservation of water in seven different soils, as influenced by their physical and mechanical composition are reported.

It was found that in the first 6 in. of soil after one cultivation there was a lower water content than in uncultivated soil. After four succeeding cultivations, however, there was always a difference in favor of the cultivated soil. In general, the soil at a depth of from 6 to 12 in. showed a greater water content when cultivated. Contrary to usual results, however, it was found that the soils containing the greater percentages of coarse material retained the most water, although these soils showed the greater rate of infiltration. These results are thought to be due, partially at least, to the manner of distribution of the different sizes of particles in the soil.

Experiments with ordinary cultivation v. no subsequent cultivation (*Ann. Rpt. Bur. Sugar Expt. Stas. [Queensland], 19 (1919), pp. 15, 16*).—Crop results from experiments to determine whether subsequent cultivation with the horse cultivator in red soil gives a higher yield of cane than where no subsequent horse cultivation is practiced showed an increase of 1.14 tons per acre in favor of cultivation.

Subsoiling v. ordinary cultivation (*Ann. Rpt. Bur. Sugar Expt. Stas. [Queensland], 19 (1919), pp. 29, 30*).—Crop results on the value of subsoiling for sugar cane as compared with ordinary cultivation were in favor of subsoiling, both in plant and ratoon crops.

Tests to determine the value of subsoiling ratoon crops (*Ann Rpt. Bur. Sugar Expt. Stas. [Queensland], 19 (1919), p. 28*).—The results of these tests were decidedly in favor of spring-tooth cultivation as opposed to subsoiling.

Quantitative and qualitative bacterial analysis of soil samples taken in fall of 1918, D. H. Jones and F. G. Murdoch (*Soil Sci., 8 (1919), No. 3, pp. 259–267*).—A bacterial analysis of 46 soils, representing 17 soil types obtained in a soil survey of Russell, Carleton, and Stormont Counties in eastern Ontario, are reported, as conducted at the Ontario Agricultural College. Each soil was represented by two samples, one taken from the surface to a depth of 6⅔ in. and the other a subsurface sample taken from 6⅔ to 20 in. depth. The purpose of the analysis was to determine the relative bacterial and mold content of the different soil samples.

While it is not considered that molds have any important rôle to play in connection with soil fertility, it is noted that yellow sand, which showed no Azotobacter, no *radicicola*, and the lowest of all bacterial counts, showed a fairly high mold count, while sandy clay loam, which gave the highest Azotobacter count and a very high *radicicola* and total bacteria count, showed no molds. With one other exception, a sandy clay shale which also gave no molds, the mold content of the samples was fairly uniform.

Microorganisms in plant chemistry and nitrogen fixation, E. Hendrick (*Chem. and Metal. Engin., 19 (1919), No. 7, pp. 574–576, figs. 6*).—This is a brief account of the development and application of microorganisms useful to plant growth by the use of humus or muck soils obtained from former swamps of New Jersey. The fixation of nitrogen is especially considered. The processes used in the mining, preparation, and development of the so-called humus are described.

The sterilization of soil by steam, M. W. Polak (*Meded. Landbouwhoogesch. [Wageningen], 17 (1919), No. 1–3, pp. 91–108, pl. 1, figs. 2*).—This report deals with the technical side of the sterilization of soils, taking up particularly the determination of the amount of steam and coal required, and the expense of operating the apparatus. Several different methods of soil sterilization by means of steam or heat are described.

On the basis of certain experiments, it is shown that in soil sterilization 1 kg. of steam when condensed to water at approximately 100° C. would theoretically liberate about 550 calories. The amount of steam in kilograms required per square meter of soil is given by the following formula:

$$Sp=1.75\,d\,s\,c+17.5$$

Sp is the number of kilograms of steam required per square meter of soil; d is the depth at which it is desired to sterilize the soil; s is the specific weight of the soil; and c is the specific heat of the soil. This formula is based on the further assumption that the minimum heat for sterilization of the average soil lies between 90° and 100°.

The amount of coal required in kilograms per square meter of soil to be sterilized is given by the formula:

$$K=\frac{d\,s\,c}{4}+2.5$$

in which K is the number of kilograms of coal.

Figures are given from actual experiments bearing out the above assumptions. Comparative figures on the cost of sterilization of soils by the perforated-pipe method, the inverted-pan method, and the formaldehyde-drench method favor the inverted-pan method, which is a method of steam sterilization used in the United States.

Lowland moor soil as fertilizer for sand, M. JABLONSKI (*Mitt. Ver. Förd. Moorkult. Deut. Reiche, 37* (*1919*), *No. 21, pp. 399, 400*).—Experiments with potatoes on sand soil, to determine the influence of additions of lowland moor soil, showed that in unirrigated sands the yield of potatoes decreased with increasing additions of moor soil, and also the total weight and starch content on the irrigated sand soils. The total yield and starch content of the crop increased with an increase in the amount of moor soil added.

Green manuring, W. H. SCHERFFIUS (*Trop. Agr.* [*Ceylon*], *53* (*1919*), *No. 5, pp. 315–318*).—The author deals with the importance of green manuring in the management of South African soils, and briefly reviews the results of work at different South African agricultural experiment stations. Attention is particularly called to the vital interdependence of the use of fertilizers and the growing of green manuring crops in the management of South African soils.

Soil fertility and fertilizers, M. CALVINO (*Rev. Agr., Com., y Trab.* [*Cuba*], *2* (*1919*), *No. 9, pp. 420–423, figs. 2*).—This is a summary of more or less well established facts on the subject of the relation between soil fertility and the intelligent use of fertilizers, based on studies conducted at experiment stations, particularly those in the United States. Special attention is drawn to the significance of the limiting factor in fertility.

The production, consumption, and requirements of plant food materials, with special reference to German agriculture, D. F. HONCAMP (*Fühling's Landw. Ztg., 68* (*1919*), *No. 15–16, pp. 281–304*).—Statistical data are summarized on the use of different commercial fertilizers supplying nitrogen, potash, phosphoric acid, and lime in German agriculture during the past 15 years, with special reference to the years just preceding and during the war.

It is concluded that insufficient use of commercial fertilizers was made in German agriculture before the war, with particular reference to those supplying nitrogen. It is stated that before the war almost all agricultural soils in Germany were deficient in nitrogen, and that nitrogen was constantly in minimum and the limiting factor in crop production. With reference to phosphoric acid, it is the opinion that many German soils are still fairly well supplied as a result of the residual effect of previous excessive applications of phosphate. Since potash and nitrogen are now available, it is the opinion that phosphoric acid will be the limiting factor in crop producton in the future.

A summary of different results obtained from the use of potash is given, and it is concluded that potash applications to German soils must be increased on an average of four times the present application.

Practical fertilizing questions, C. von Seelhorst (*Jour. Landw., 67* (*1919*), *No. 1-2, pp. 63-74*).—In view of the scarcity of phosphoric acid fertilizers in Germany, plat experiments were conducted with a number of common field crops using complete fertilizers and fertilizers containing either nitrogen, phosphoric acid, or potash alone, or combinations of any two of these fertilizing agents.

It was found on a number of different soils that where phosphoric acid was not applied there was practically no difference between the crop obtained and that where phosphoric acid was used. It is concluded, therefore, that for a few years at least there are many different soils which will not require phosphoric acid fertilization, and that this agent may be omitted from fertilizers. The results of the experiments, however, indicate the importance of fertilization with nitrogen and potash. The importance of initiating investigations to determine accurately on what soils and under what conditions phosphoric acid fertilization may be safely omitted is emphasized. The experiments also indicated that the proper use of lime on some of the better types of soils of Germany would have a distinct effect in making available some of the relatively insoluble iron and aluminum phosphates.

Iowa soils: Their improvement, W. H. Stevenson (*Iowa Agr., 20* (*1920*), *No. 10, pp. 422-425, figs. 4*).—This is a brief review of results established at the 75 soil experiment fields in the State of Iowa, which indicate that many Iowa soils need lime and that it is very profitable to apply this material on a large number of these soils. Manure is deemed an exceedingly valuable fertilizer when applied to most Iowa soils. Many Iowa soils respond profitably to applications of rock phosphate or acid phosphate, and complete commercial fertilizers in many cases increase crop yields when used to supplement manure.

The maintenance of soil fertility (*Ohio Sta. Bul. 336* (*1919*), *pp. 579-649, pl. 1, figs. 15*).—This bulletin reports average data of 25 years' field experiments at Wooster, Strongsville, Germantown, Carpenter, and Findlay with manures and fertilizers and average data for 5-year and 6-year periods, the last progress report of which was contained in Bulletin 303 of the station (E. S. R., 36, p. 829).

The soils employed in these experiments have included silty clay loams derived chiefly from sandstones and shales and relatively deficient in lime, and heavier clay loams derived from limestones and limestone gravels. Most of these soils were below the average soils of the region in which they are located in productiveness at the time the experiments were begun.

Great differences were found in the requirements of these soils for lime. Every soil included in these experiments, whether derived from sandstones or from limestones, has responded profitably to applications of phosphorus. Of the carriers of phosphorus used, acid phosphate proved the most effective in proportion to cost, followed in order by basic slag and steamed bone meal. Finely ground raw rock phosphate returned a profit on its cost, but the effectiveness of acid phosphate was so much greater as to make the use of raw rock phosphate relatively unprofitable.

Potassium generally increased crop yields, and when used as a reinforcement of phosphorus and in relatively small quantities its use at normal prices was profitable, especially on potatoes and tobacco. It was found that the maintenance of the nitrogen supply of these soils was of no less importance than that of lime or phosphorus, but that owing to the cost of purchased nitrogen the growing of leguminous crops in rotation and the careful saving and use of animal manures must be the chief means of obtaining nitrogen for economically managed Ohio soils.

The possibility of greatly increasing the effectiveness of manure by protecting it from the losses due to heating and leaching and by reinforcing it with phosphorus was demonstrated. The experiments indicate, however, that the value of manure is measured by the nitrogen and mineral elements contained, that the chief function of its organic matter content is to serve as a carrier for these elements, and that if it is so managed as to release these elements before it goes to the field its value is very materially reduced.

Report on fertilizer experiments, E. B. STOOKEY (*Washington Sta., West. Wash. Sta. Mo. Bul., 7 (1920), No. 10, pp. 157–159, fig. 1*).—A summary is given of six years' fertilizer experiments with four different crops, continuing a previous account (E. S. R., 40, p. 422). The following general conclusions are drawn: (1) On muck soils a limited amount of potash in manure or commercial form can be profitably used, even at the present high prices, (2) the use of a phosphorus fertilizer will be profitable on much of the upland and valley loam soils, and (3) nitrogenous fertilizers may sometimes be used with profit on some upland soils where nitrogen can not be provided by manure or by growing and plowing under some leguminous crop.

Artificial manures: Experiments on their value for crops in western India, H. H. MANN and S. R. PARANJPE (*Dept. Agr. Bombay Bul. 89 (1918), pp. [II]+33*).—Experiments are reported on the use of artificial fertilizers on tobacco, potatoes, wheat, cotton, sugar-cane, chillies, onions, and bananas, on western Indian soils. It is noted that the recommendations are based on normal conditions as regards prices for fertilizers.

For tobacco on the Deccan, with irrigation available for reserve use and with soil in fairly good condition, the use of 150 lbs. of potassium sulphate, 112 lbs .of superphosphate, and 285 lbs. of sodium nitrate per acre is recommended. For potatoes it is advised that, in addition to the barnyard manure usually given, 150 lbs. of potassium sulphate, 112 lbs. of superphosphate, and 120 lbs. of ammonium sulphate per acre be applied on the Deccan with irrigation.

For cotton, where the rainfall is regular and reliable, it is recommended that 2 tons of barnyard manure per acre be plowed into the land before the seed is sown, and that 200 lbs. of superphosphate per acre be added with the seed. In addition, either 135 lbs. of sodium nitrate or 100 lbs. of ammonium sulphate should be either top-dressed six weeks after sowing or be mixed with the superphosphate at the time of seeding.

For sugar-cane on well-prepared soil, with abundant irrigation, it is recommended that either 35 cartloads of barnyard manure with 224 lbs. of superphosphate and 300 lbs. of potassium sulphate be applied per acre before the field is ridged for planting, or that 1,200 lbs. of cake and 375 lbs. of ammonium sulphate per acre be applied at the time of earthing up the cane. It is added that in the sandy soils of the Gokak Canal tract the top-dressing should consist only of 2,400 lbs. of cake per acre. Other general recommendations are made regarding the fertilization of the garden crops.

Manurial studies, J. B. KNIGHT (*Dept. Agr. Bombay Bul. 90 (1918), pp. 7–23*).—Experiments have shown that the use of sann hemp green manure as a source of bulky fertilizer in Bombay will produce as good crops as, and at less cost than, barnyard manure. Experiments with trash, including any waste products like compost, weeds, safflower stalks and hulls, and cotton waste, as a coarse manure, showed a decided advantage of this material over barnyard manure as regards economy. Further experiments indicated the extreme importance of the utilization of stable manure in the vicinity of military cantonments and large cities, the results of three years' tests, showing practically the same results with such stable manure as the barnyard manure, and four years' tests showing equal or better results than with green manuring.

The results of three years' experiments on the use of general commercial fertilizers supplying potash, phosphorus, and nitrogen indicate that under the conditions prevailing in Bombay, the use of commercial fertilizers will pay when obtainable at normal prices. Experiments on the use of the ashes of trash and cane waste as a source of potash and phosphoric acid showed practically as good results on cane as with manure, sodium nitrate, and oil cake. Better results were obtained with ammonium sulphate on cane than with sodium nitrate. Comparisons of ammonium sulphate with fish meal and different oil cakes indicated the superiority of ammonium sulphate and fish meal. The cottonseed cake gave slightly better results than castor cake, peanut cake, and safflower cake, although the difference between the four was small. An experiment comparing cottonseed cake with safflower cake on cane showed a yield with cotton seed fully 10 per cent the higher. Further tests indicated that heavy manuring on these soils is a wasteful practice.

Memorandum on the use of artificial manures on the tea estates of Assam and Bengal, decade 1907–1917, G. D. HOPE (*Indian Tea Assoc. [Pamphlet], 2 (1918), pp. [III]+1–21*).—This memorandum reviews the use of fertilizers on the estates in the northeast India tea districts for the period from 1907 to 1917, inclusive.

It is stated that, as regards the available fertilizers in the tea districts themselves, matters are practically unchanged since the year 1907, except that the demand for locally obtainable oil cake has exceeded the supply, and that the recently developed popularity of lime as a fertilizer for tea has produced a local market for the limestone which is found in certain parts of the tea districts. The huge export of bones and the growing importation of superphosphate and basic slag into India are due to the fact that no means are available in India for converting bones into more quickly acting phosphatic fertilizers. The northeast Indian tea estates have now entered the field as a definite competitor for sodium nitrate.

It is stated that basic slag, superphosphate, ammonium sulphate, guanos, nitrolime, calcium nitrate, and mixed fertilizers are imported into Indian from the United Kingdom, while only sodium nitrate and sulphur are imported from America. Superphosphate, sulphur, and sodium nitrate are imported from Japan, sulphur from Sicily, and potassium chlorid and potassium sulphate from Germany. Oil cakes and bone, fish, meat, and blood manures have never been imported in more than very small amounts. Sodium nitrate, ammonium sulphate, and lime are now obtainable in India in considerable quantities.

Fertilizer tests on seed beds in the fall of 1917, J. VAN DIJK (*Meded. Deli-Proefsta. Medan, 2. ser., No. 8 (1919), pp. 6–21*).—The results of 22 fertilizer tests on seed beds in the fall are reported.

Better results were obtained with the fertilizers when they were covered to a depth of 2½ cm. (1 in.). In general, the best proportions between nitrogen and phosphoric acid were 1:3, except in special cases. A portion of 1:2 between nitrogen and potash gave usually the best results. Substitution of organic fertilizers for ammonium sulphate was satisfactorily accomplished by the use of horn meal. In general, double superphosphate gave better results than superphosphate. Thomas phosphate and Ephos phosphate were found to be useless for seed-bed fertilization, and not much better results were obtained with Angauer phosphate, precipitated phosphate, and guano. It is thought that steamed bone meal can eventually be substituted for superphosphate or double superphosphate. Tobacco ashes gave the same results as potassium magnesium sulphate and potassium bicarbonate, and probably also as potasium silicate.

Tests to determine the action of fertilizers on plant crops of cane and their effect on succeeding ratoon crops (*Ann. Rpt. Bur. Sugar Expt. Stas. [Queensland], 19 (1919), p. 27*).—No definite conclusions were drawn from these experiments, the results with three crops being practically identical. The tests are to be repeated.

The nitrification of stable manure nitrogen in cultivated soil, C. Barthel (*Centbl. Bakt. [etc.], 2. Abt., 49 (1919), No. 14–17, pp. 382–392*).—Experiments with cultivated soils of different reaction are reported, which showed that under conditions especially favorable for nitrate formation, during four or five months, the nitrate nitrogen formed corresponded only to a greater or less part but not to the total of the ammonia nitrogen available in the solid manure. The action of the nitrogen of the solid manure in the first cropping season is ascribed mainly to its content of ammonia nitrogen. This content can not be considered to indicate the value of stable manure as a nitrogenous fertilizer, since the entire content of ammonia nitrogen was not transformed into nitrate, and since the residual effect of the manure is to be ascribed to other nitrogen compounds.

In the same series of experiments, the amount of nitrate nitrogen formed from the ammonia nitrogen of the manure was constant and was independent of added amounts of manure. In cultivated soils in good tilth, but with a distinct acid reaction, nitrate formation was as powerful as in neutral soils. The previous findings of other experimenters that the nitrification of nitrogen in ammonium sulphate is much poorer in acid soils than that of organic nitrogen was confirmed by these experiments. This relation is explained on the basis of the increase of the hydrogen-ion concentration which occurs when ammonium sulphate is decomposed in acid soils.

Conservation of the nitrogen of liquid manure, Henkel (*Landw. Jahrb. Bayern, 8 (1918), No. 1, pp. 3–20, fig. 3*).—A description is given of several different processes for the conservation of the nitrogen from liquid manure, special reference being made to the so-called Ortmann system in which the solid and liquid parts of manure are separated and the liquid given special storage treatment. Experiments with different methods are reviewed, and it is concluded that the Ortmann process can be recommended, but that it should be simplified.

I, The conservation of liquid manure nitrogen with formaldehyde. II, The bacterization of moor soils, Vogel (*Mitt. Deut. Landw. Gesell., 33 (1918), No. 42, pp. 582–585; also in Zentbl. Agr. Chem., 48 (1919), No. 8, pp. 292–296*).—Experiments with oats, using liquid manure treated with 30 per cent formaldehyde solution at rates of 1 and 2 per cent and pure hexamethylentetramin, which is the product of the combination of formaldehyde and liquid manure, showed that the treated liquid manure and the products therefrom gave as good results as ammonium sulphate or sodium nitrate, and in some cases better results. The better results were obtained with the treated liquid manure where it was mixed with the soil to a depth of 6 cm. (2.3 in.). There was no apparent injury to the crop from the use of the formalin.

Owing to the relative unavailability of formalin, parallel experiments were conducted with sewage and by-products of the chemical industries containing formalin. So-called bakelite water, used in place of the formalin, gave almost as good results.

Experiments on the bacterization of organic fertilizers, including peat, blood meal, corn meal, Rehmsdorf fertilizer, and humogen, led to the conclusion that good results in this respect are dependent upon methods promoting an extraordinary increase in the bacteria which decompose and dissolve organic fertilizers.

Poultry manure: Its nature, care, and use, F. T. Shutt (*Canada Expt. Farms, Seasonable Hints No. 15 (1919), pp. 12, 13*).—This report gives general information regarding the nature, care, and use of poultry manure, with a summary of a series of analyses of samples collected without litter or absorbent as conducted at the experimental farm at Ottawa. From these data it is concluded that, in general, poultry manure as collected beneath the roosts is from two or three times richer in nitrogen and from three to eight times richer in phosphoric acid than the ordinary farm manures.

The sodium nitrate industry of Chile, A. Bertrand (*Chim. et Indus. [Paris], 3 (1920), No. 1, pp. 3–18, figs. 9*).—The sodium nitrate industry of Chile is described, with particular reference to questions of industrial technology entering into the mining and refining of sodium nitrate. Other practical industrial questions, such as transportation and export, are also discussed.

Sodium nitrate in 1919, D. F. Irvin (*Engin. and Min. Jour., 109 (1920), No. 3, pp. 219–221*).—It is stated that during the course of 1919 the acute depression in the Chilean nitrate industry, due to an almost complete cessation of sales, was the feature of greatest importance. The result in Chile was to shut down many plants. The exportation of sodium nitrate during the period from January to October, 1919, inclusive, is given as 585,190 tons, as compared with 3,174,330 tons for the same period of the previous year. It is stated that artificial fertilizers can not generally compete successfully with the natural product on the basis of manufacturing cost, quality, and quantity, but a warning as to the possibilities of such competition is given. During the crisis of 1919, there was a considerable lag in the development of technique. A modified export tax is advocated, as likely to greatly help conditions.

Taxing the air for increased food production, J. G. Lipman (*Jour. Amer. Soc. Agron., 11 (1919), No. 9, pp. 333–341*).—The author discusses the more systematic and intensive use in agriculture of nitrogen compounds that are the resultants of electrochemical and microbiological processes. Considerable statistical and economic data on nitrogen losses from soils are given, it being estimated that the annual loss from the arable land in the United States will amount to approximately 9,000,000 tons of nitrogen. In this connection it is pointed out that the nitrogen compounds added to this arable land in the form of animal manures, leguminous green manures and residues, the body substances of nonsymbiotic nitrogen-fixing organisms, ammonia and nitric acid in atmospheric precipitation, and nitrate, ammonia, and organic nitrogen in commercial fertilizers represent an equivalent of 5,000,000 to 6,000,000 tons of nitrogen, leaving a net annual deficit of possibly 3,000,000 to 4,000,000 tons of nitrogen. The fixation of atmospheric nitrogen is discussed, and a plea is made for further research and demonstration on the manufacture and use of nitrogenous fertilizers.

A new process for the synthesis of ammonia, H. Hampel and R. Steinau (*Chem. Ztg., 1918, No. 146–147, p. 594; also in Zentbl. Agr. Chem., 48 (1919), No. 6, pp. 218, 219*).—A brief description is given of a process for ammonia production by the use of iron filings and ammonium chlorid under the action of heat and pressure, and utilizing nitrogen from the air.

With suitable apparatus, the author found that with a pressure of less than 50 atmospheres and a temperature of around 300° C., a gaseous mixture could be obtained which contains 93 per cent ammonia. Of this ammonia about 75 per cent originally existed in the process or was utilized in precipitating metallic salts, while about 23 to 24 per cent was new ammonia available for use.

Outlook for sulphate of ammonia, C. G. Atwater (*Amer. Fert., 52 (1920), No. 4, pp. 74–78*).—Information on the production and practical use of ammonium sulphate as a fertilizer is given. Attention is called to the usual necessity of using lime with ammonium sulphate, based on results obtained from different agricultural experiment stations. It is stated that the output of ammonium sulphate in this country during 1919 will closely approximate 500,000 tons.

The influence of supplementary fertilization with iron oxid or salt on the action of lime nitrogen or ammonium sulphate, O. Lemmermann and A. Einecke (*Mitt. Deut. Landw. Gesell., 33 (1918), No. 41, p. 574; also in Zentbl. Agr. Chem., 48 (1919), No. 8, pp. 290–292*).—Experiments with rye and beets showed that iron oxid had no favorable influence on the fertilizing action of lime nitrogen. With barley, the addition of salt had no appreciable influence on the fertilizing action of either lime nitrogen or ammonium sulphate. Experiments with beets to compare sodium nitrate, ordinary lime nitrogen, and lime nitrogen containing an excess of sodium, showed that there was practically no difference between the fertilizing actions of the two forms of lime nitrogen. The crop yields in both cases were smaller than with the use of sodium nitrate.

The manufacture of potassium nitrate and ammonium sulphate from crude potassium salts, a new method for the combination of ammonia, H. Hampel (*Chem. Ztg., 43 (1919), Nos. 113, pp. 617–619, fig. 1; 115, pp. 634–636, fig. 1*).—Two methods of converting the gaseous ammonia of the coke ovens into a form suitable for fertilizers are described, which involve the utilization of the sulphates found in the German potash deposits. The first method, which is known as the nitrate process, depends upon the following cyclic reactions:

$$K_2SO_4+Ca(NO_3)_2=CaSO_4+2KNO_3$$
$$CaSO_4+2NH_3+CO_2+H_2O=CaCO_3+(NH_4)_2SO_4$$
$$CaCO_3+2HNO_3=Ca(NO_3)_2+CO_2+H_2O$$

An apparatus by means of which the reaction may be brought about with the use of sulphate-containing crude potassium salts and carnallite is described and illustrated. The principal advantage of the method described, as compared with the well-known gypsum and sulphuric acid methods, is considered to be in the cheapness of the raw materials.

For a second method, in the application of which the same apparatus is used, carnallite or kainit may be used, although the latter is preferred on account of its high sulphate content. The reactions involved in this method are as follows:

$$MgSO_4+CaCl_2=MgCl_2+CaSO_4$$
$$CaSO_4+2NH_3+CO_2+H_2O=CaCO_3+(NH_4)_2SO_4$$
$$CaCO_3+2HCl=CaCl_2+H_2O+CO_2$$
$$MgCl_2+H_2O=MgO+2HCl$$

It is pointed out that this is a true cyclic process, all the intermediate products formed being necessary for the successive reactions.

The application of these methods with special reference to the Rhenish-Westphalian coke-oven ammonia is discussed and the conclusion drawn that it offers very promising possibilities.

The catalyst for the oxidation of ammonia, G. A. PERLEY (*Chem. and Metall. Engin., 22 (1920), No. 3, pp. 125–129*).—This paper describes the general types of equipment employed commercially for the production of nitric acid by the catalytic oxidation of ammonia, and discusses other factors involved in the theoretical decomposition reactions.

Leather meal as a source of nitrogen for plants, T. PFEIFFER, W. SIMMERMACHER, and H. FRISKE (*Fühling's Landw. Ztg., 67 (1918), No. 3–4, pp. 62–75, fig. 1*).—A number of cropping experiments and studies of ammonification and nitrification with raw leather meal, steamed leather meal, and leather meal treated with sulphuric acid are reported.

As a source of nitrogen for crops, such as oats and mustard, the best results were given by the treated leather meal and poorest results by the raw-leather meal. It is concluded that raw leather meal can not be considered as a fertilizer, owing to its inactivity as a source of nitrogen. The experiments indicated no marked residual effect of the raw-leather meal. The nitrification studies showed the same relative values of the leather meals as the cropping experiments. It is further concluded, in case other sources of nitrogen are not available, that the leather meal treated with sulphuric acid may be used with good results, but that its effectiveness will always be inferior to that of the common sources of ammonia and nitrate.

The manufacture and distribution of acid phosphate, S. L. CARTER (*Amer. Fert., 52 (1920), No. 4, pp. 61–66*).—General information is given on the manufacture of acid phosphate, factors to be considered in its storage and shipment, and its practical selection and use.

Wood ashes and production of potash, E. BATEMAN (*Chem. and Metall. Engin., 21 (1919), No. 12, pp. 615–619, figs. 4*).—This contribution from the U. S. Forest Products Laboratory at Madison, Wis., consists of data on the potash content of North American woods and of commercial ashes obtained from various species and on the estimated yearly production of available hardwood ashes from various States, together with a description of the manufacture of crude potash from wood ashes and estimates of the cost of such manufacture.

From the data presented the conclusion is drawn that "the manufacture of potash from wood ashes will not be a paying proposition when normal prices are resumed, except in those cases where the plant has already been paid for and is owned by the potash maker, who makes no charge for his own labor but accepts his profits as compensation for his work. Under these conditions the cost of manufacture of potash, exclusive of the cost of ashes, may be reduced to about 5 cts. a pound and might be able to compete with imported potash on a small scale under normal conditions."

Some chemical aspects of the potash industry in Great Britain, E. C. ROSSITER and C. S. DINGLEY (*Jour. Soc. Chem. Indus., 38 (1919), No. 22, pp. 375T–383T, fig. 1*).—This paper contains the results obtained from an examination of the possible production of potash from the blast furnaces of England and of Wales.

It was found that, by the addition of salt to the furnace charge, the greater part of the potash is volatilized and can be recovered in the gas instead of being carried into the slag and rendered unavailable. It is estimated that from

33 to 80 per cent of the potash can be thus volatilized and rendered recoverable by the use of adequate gas-cleaning plants, and that in this way about 80,000 tons of potassium chlorid, equivalent to some 50,000 tons of potash expressed as K_2O, can be recovered annually from the blast furnaces of England and Wales.

Potash recovery from blast-furnace gases in England, H. HIBBERT (*Chem. and Metall. Engin., 21 (1919), No. 14, pp. 723–726*).—A description is given of potash recovery as carried out in connection with English blast-furnace operations and to a less extent with cement manufacture, with a view to stimulate interest in a similar recovery of potash from like industries in this country.

Potash salts in 1919, W. C. PHALEN (*Engin. and Min. Jour., 109 (1920), No. 3, pp. 228–230*).—This is a review of the status of potash production during the year 1919, with particular reference to conditions in the United States and Germany.

The origin of German potash beds, E. JÄNECKE (*Ztschr. Angew. Chem., 32 (1919), [No. 46], Aufsatzt., pp. 178–181, figs. 6*).—The author concludes from his studies that the potash beds of Germany have originated from sea water which has evaporated from a great basin. The theory is that the concentrated salt solutions were collected during seepage into the southern part of the basin and here the potash salts were separated out, sinking to a depth of 3,000 meters or more, to concentrate in the present beds.

The necessity for a supply of pure agricultural lime, G. S. ROBERTSON (*Analyst, 44 (1919), No. 522, pp. 309–314*).—Analyses of several samples of different types of agricultural lime are reported and discussed, with particular reference to their agricultural value.

It is shown that the purity of agricultural ground lime is rather low. Since it is considered to be the most economical and convenient form of lime to purchase in Canada, the necessity for obtaining a pure supply is emphasized. The purity of agricultural lump lime is considered to be very satisfactory, and the cost per unit of lime to be appreciably less than that in ground lime. The ground calcium carbonate is generally very pure, but the cost per unit of lime is considerably more than that in ground lime. It is recommended that the sale of ground lime, lump lime, and chalk should be brought within the provision of the Fertilizers and Feeding Stuffs Act.

Experiments on lime and marl, H. R. CHRISTENSEN (*Tidsskr. Planteavl, 25 (1918), p. 377; also in Zentbl. Agr. Chem., 48 (1919), No. 6, pp. 215–217*).—Experiments with different crops on sand soils and light loam soils in Denmark, which were generally acid and showed either a weak or no Azotobacter content, are reported, the purpose being to compare marl with caustic lime, different lime quantities, and different kinds of limes.

Good results were obtained on beets and on meadow, especially on unlimed meadows where clover did not prosper. On the loamy soils in southern Denmark good results were obtained only on beet fields. This is attributed mainly to the influence of lime on the soil microflora. In certain cases liming injured crops by favoring diseases, especially in the case of oats. The content of the soil in available plant nutrients had a marked influence on the action of lime; the greater the plant nutrient content the smaller the lime action. Barley proved to be most sensitive to lime deficiency, especially as compared with oats. Rye was also more sensitive to lime deficiency than oats. In the meadow experiments the content of legumes in the hay yield was markedly less on unlimed than on limed soils. Of the legumes, lucerne appeared to be more sensitive to lime deficiency than clover. The yield of lupines was also markedly increased by the additions of lime.

It was found that the residual action of lime varied from year to year with the type of crop. The greatest action of lime with oats and mixed cereals was obtained in one year owing to diseases. The variation in the residual effect of lime is also attributed to the difference in the fertility of the soil.

The experiments with different forms of lime showed that raw chalk gave a smaller yield than finely ground chalk. The yields increased with increasing additions of finely ground chalk. In general the greater lime quantities produced the greater yields regardless of the form of the lime.

It is not considered advisable from the results of these experiments to apply lime annually, but to make larger applications at longer intervals. Laboratory experiments on the solubility of different forms of lime in water saturated with carbon dioxid showed that the weaker limes, such as chalk and bleach, were more rapidly and easily dissolved than the hard limestones of the same degree of fineness. The weathering of the different limes followed substantially this same rule, but it is shown that the degree of fineness is a more important factor in weathering than hardness.

Right use of lime in soil improvement, A. Agee (*New York: Orange Judd Co., 1919, pp.* [*III*]+*89*+[*I*], *pls. 21*).—This is a popular treatise on the relation of lime to soil improvement and the proper use of lime on soils. Acid soils are discussed, and an attempt is made to describe simple means for detecting soil acidity. The different types of lime are discussed with reference to their origin, preparation, and use, and final information is given on the special demands of different soils and crops for lime.

Objects of liming (*Trop. Agr.* [*Ceylon*], *53* (*1919*), *No. 5, pp. 319–321*).—This is a review of experiments in different parts of the world showing the benefits of liming on soils, particularly in South Africa. It is pointed out that experiments conducted in order to determine the effect of lime on potash and phosphoric acid in the soil indicate that, at least in soil on which no crop was grown, there was practically no increase in the amounts of available potash or phosphoric acid after a month over that produced in unlimed soil, and in loamy or clay soils the original water-soluble potash was decreased. It is stated, however, that experiments have shown that the available phosphates are in general increased by liming, and that even those soils which analysis shows to be fairly well supplied with lime will usually be benefited by liming.

Liming, cultivation, and manurial experiments (*Ann. Rpt. Bur. Sugar Expt. Stas.* [*Queensland*], *19* (*1919*), *pp. 8–14*).—Experiments on the influence of liming with and without subsoiling showed that, upon alluvial soils generally, the average returns of sugar cane from the nonsubsoiled plat were somewhat better than where the subsoiler was used. Liming experiments with and without mixed manures demonstrated the advisability of applying manures to ratoons rather than to plant cane, no increase being obtained from the use of fertilizers on the latter. On plats treated with and without mixed manures without lime, it was found that the increase in tonnage from the use of manures was much higher than from plats upon which lime was used.

The influence of lime on the nitrification of barnyard manure-nitrogen in arable soil, C. Barthel and N. Bengtsson (*Soil Sci., 8* (*1919*), *No. 3, pp. 243–258*).—Experiments conducted at the Central Agricultural Experiment Station at Stockholm, Sweden, are reported, in which it was found that, on the addition of lime in the form of calcium carbonate and stable manure to cultivated soil of both neutral and acid reaction, no favorable action of the lime on the nitrification of the stable-manure nitrogen resulted. On the contrary, an impeding effect occurred in cases where the supply of lime was larger than is probably ever used in practice. No final attempt is made to explain the cause of this impeding action of the lime.

Sulphur in relation to soil, W. L. POWERS (*Reclam. Rec.* [*U. S.*], *11* (*1920*), *No. 1, pp. 28, 29, fig. 1*).—A review is given of experiments conducted at different agricultural experiment stations on the use of sulphur as a fertilizer, and some specific results obtained at the Oregon Experiment Station are reported.

It was found in experiments with acid phosphate and calcium sulphate that crop increases secured by these fertilizers could be produced by the use of elemental sulphur. Calcium and potassium sulphates and acid phosphate gave substantial increases in yields over untreated plats or plats treated with potassium chlorid. It is noted that grain crops have shown 20 per cent increases from sulphur fertilization. Eight lbs. of sulphur or about 200 lbs. of calcium sulphate have been found to be sufficient. The former benefits crops for at least four years, while the latter form acts more promptly.

"Use of sulphur on different soils and at different rates in various sections of Oregon strongly indicates that sulphur is of value to many soils of the State that lack sufficient of that essential element to permit continued farming and increased yields. Acid soils in Willamette Valley have shown little or no response to sulphur treatment, though calcium sulphate is commonly used and is beneficial to legumes." See also a previous note by Reimer and Tartar (E. S. R., 42, p. 221.)

The action of chromium and manganese on plant growth, T. PFEIFFER, W. SIMMERMACHER, and A. RIPPEL (*Fühling's Landw. Ztg.*, *67* (*1918*), *No. 17–18, pp. 313–323*).—Plat experiments with oats and barley to determine the stimulating influence of different chromium compounds, including chromium iron ore, are reported.

Favorable results were obtained in some cases and unfavorable results in others, and the conclusion is drawn that the value of the use of chromium compounds by practical farmers is not yet thoroughly established.

Experiments with oats to determine the stimulating influence of manganese compounds, particularly manganese sulphate, showed that as stimulators of plant growth the manganese compounds were practically inactive.

Our mineral supplies, H. D. MCCASKEY, E. F. BURCHARD, ET AL. (*U. S. Geol. Survey Bul. 666* (*1919*), *pp. 278, pl. 1, figs. 6*).—This is a collection of papers discussing the source of supply and use of, and the normal demand for, different minerals, including particularly gypsum, phosphate rock, potash, and limestone and lime, some of which have been previously noted from time to time.

Some developed mineral resources and chemical industries of the Southern States, A. M. FAIRLIE (*Amer. Fert.*, *52* (*1920*), *No. 3, pp. 77, 78, 118, 120, 122, 124, 128, 130, 134*).—A summary is given of important facts regarding the phosphate rock, sulphur, pyrites, and pyrrhotite and cupriferous sulphid industries in the Southern States, with particular reference to the manufacture of fertilizers.

The manufacture and fertilizing action of guanol, A. GEHRING (*Fühling's Landw. Ztg.*, *68* (*1919*), *No. 13–14, pp. 259–277*).—A description is given of the manufacture of guanol, which consists of a mixture of molasses sludge and peat, and a number of experiments are reported on its value as a general fertilizing agent. Experiments with clay, humus sand, and poor sand soils showed that the addition of dry guanol at the rate of 1 gm. per 4 kg. of soil increased carbon dioxid production in the different soils 60, 53, and 62 per cent, respectively.

It is noted that in the process of manufacture of guanol two kinds are formed, one in the shape of kernels of acid reaction and the other a dark colored outer substance of neutral reaction. Tests on clay soil showed that carbon dioxid production was always greater with the kernel guanol. Tests of carbon dioxid production with sterilized and untreated kernel guanol showed that while the production was smaller at first with the sterilized guanol it gradually equalled and finally exceeded that with the untreated guanol, confirming the opinion that the increase in soil bacteria through the use of guanol is marked. The loss of gaseous ammonia from guanol through the decomposition of its betain content was less in the kernel guanol.

Studies of the ammonia absorbing power of different peats showed that a certain type of so-called white peat gave the best results as regards the conservation of ammonia in the manufacture of guanol. Further studies showed that in the manufacture and use of guanol there is a bacterial decomposition of the peat which, it is concluded, results in the peat having a fertilizing as well as a mechanical function.

Marine alga and its utilization, A. Trotter (*Agr. Colon.* [*Italy*], *13* (*1919*), *No. 11, pp. 469–475, fig. 1*).—A discussion is given of the chemical composition of *Posidonia oceanica*, reference being made to it as a possible source of fertilizer. Analysis of the dried plant showed a content of 75.84 per cent organic matter, 0.46 per cent total nitrogen, and 0.073 per cent potash. Another analysis of the plant showed a content of 5.7 per cent potash.

The manure value of broom-millet ash, F. B. Guthrie (*Agr. Gaz. N. S. Wales, 30* (*1919*), *No. 10, p. 735*).—Analysis of a sample of broom-millet ash is reported, showing a potash content of 15.58 per cent and a phosphoric acid content of 4.67 per cent. As a source of potash it is considered probably valuable.

Some aspects of fertilizer control, S. K. Johnson (*Amer. Fert., 52* (*1920*), *No. 4, pp. 79–81*).—A brief outline is given of the procedure followed in State fertilizer inspection, special attention being called to the object of fertilizer laws.

Fertilizers, A. Calderón (*Abonos.* [*Madrid*]: *Min. Fomento, Dir. Gen. Agr., Minas, y Montes, 1919, pp. 15*).—An outline is given of methods of inspection of fertilizers authorized as legal in Spain.

Registration brands of fertilizer (*Bul. N. C. Dept. Agr., 40* (*1919*), *No. 11, Sup., pp. 101*).—This bulletin contains a list of 4,793 brands of fertilizers which have been registered in the State of North Carolina during the year 1919, together with figures showing their guarantied analyses.

I, Analyses of fertilizers, season 1918–19.—II, Analyses of cottonseed meal, B. W. Kilgore et al. (*Bul. N. C. Dept. Agr., 40* (*1919*), *No. 10, pp. 61*).—This bulletin contains analyses of 1,154 fertilizers and fertilizing materials, including 213 samples of cottonseed meal, collected for inspection in North Carolina during the fall months of 1918 and the spring months of 1919. It is stated that the analyses show the fertilizers and meals to be about as heretofore and, in general, to meet their guaranties.

Inspection of commercial fertilizers, P. H. Wessels (*Rhode Island Sta. Ann. Fert. Bul., 1919, Oct., pp. 3–11*).—This bulletin contains the results of analyses of 68 samples of commercial fertilizers, 5 samples of wood ashes, and 4 samples of limes collected for inspection in Rhode Island during 1919.

It is noted that in addition to chemical examination of the water-insoluble nitrogen in commercial fertilizers, in cases where the water-insoluble nitrogen present made it a matter of some importance pot fertilizer tests were conducted. In eight cases the water-insoluble nitrogen of commercial fertilizers was found to be of poor quality. Of 180 guaranties made for commercial fertilizers, 86 per cent were found to be above the guaranty and 14 per cent below.

One sample of barium phosphate was collected, which contained 1.28 per cent of available phosphoric acid. A pot experiment with lettuce showed that as a source of phosphorus, barium phosphate applied at the rate of 1 ton per acre produced no increase; also on acid soil it was found that 1 ton of barium phosphate gave negligible results with lettuce as a neutralizer of acid soil conditions.

Commercial fertilizers in 1918–19, G. S. FRAPS (*Texas Sta. Bul. 248* (*1919*), *pp. 3–27*).—This bulletin reports analyses and valuations of some 434 samples of fertilizers and fertilizing materials collected for inspection in Texas under the State fertilizer law during 1918–19. In addition a list of brands registered for sale in the State during the period is given, together with general information on the operation of the fertilizer inspection.

AGRICULTURAL BOTANY.

Studies on self-sterility, III–V, E. M. EAST (*Genetics, 4* (*1919*), *No. 4, pp. 341–363*).—Three papers are given.

III. *The reaction between self-fertile and self-sterile plants* (pp. 341–345).—Before the publication of work previously noted (E. S. R., 38, p. 823), the author had collected facts indicating a simple one-factor difference between self-sterile and self-fertile plants in keeping with the views of Compton as formerly noted (E. S. R., 29, p. 136). It is now stated that the position then taken has been confirmed, as in the material investigated a single essential Mendelian factor has been demonstrated. Later work (E. S. R., 41, p. 430) is also referred to.

Data reported herein are claimed to show that in Nicotiana self-sterility is due to the presence of the allelomorph of a dominant fertility factor, *f*. When a population is homozygous for this factor, *ff*, it is self-sterile. The factors which control the peculiar and systematic behavior of self-sterile plants when intercrossed among themselves are wholly independent of this factor, and the latter does not need to be considered in an interpretation of their expression.

The manifestation of self-sterility, as evinced by the degree to which pseudo-fertility shows, is considered due to a subsidiary inherited factor (or factors), but without the presence of the principal factor *ff* there is no evidence that it functions.

IV. *Selective fertilization* (pp. 346–355).—In this work, designed to test the possibility of the occurrence of selective fertilization in self-sterile Nicotianas, comparisons were made between the pollen tube frequency distributions of highly heterozygous and of comparatively homozygous plants. The influence of compatible matings on incompatible matings was also investigated, and in neither case was there any indication of selective fertilization. The evidence obtained is discussed.

V. *A family of self-sterile plants wholly cross-sterile inter se* (pp. 356–363).—This is a study of questions arising from data obtained in the course of work previously noted as referred to above.

Hybridization as a cause of apogamy in plants, A. ERNST (*Bastardierung als Ursache der Apogamie im Pflanzenreich. Jena: Gustav Fischer, 1918, pp. XIV+666, figs. 172, pls. 2*).—This is a monograph giving an extended account of studies involving hybridization, apogamy, the species concept, and the origin of species.

On chlorophyll, carotin, and xanthophyll, and on the production of sugar from formaldehyde, A. J. EWART (*Proc. Roy. Soc. Victoria, n. ser., 30* (*1918*), *No. 2, pp. 178–209*).—Extended investigations are reported and discussed on sugar formation in plants, from which the following conclusions are drawn:

"In the assimilation of carbon dioxid, chlorophyll acts as a light energizing enzym, and takes direct part in the cycle of chemical changes, which probably have carotin, xanthophyll, phytyl, and glaucophyllins as intermediate products and glucose, levulose, formaldehyde, and oxygen as end products. The sugar may be formed directly as well as through the polymerization of formaldehyde. A large part of the energy represented by the carbohydrate products is absorbed during the reconstruction of the chlorophyll molecule. Carbon dioxid decomposes extracted chlorophyll both in light and in darkness, removing its magnesium and producing phaeophytin. The earlier supposition that xanthophyll is one of the products has not been sustained. In the presence of zinc dust, the zinc takes the place of the magnesium, and the chlorophyll remains green as a stable zinc chlorophyll.

"Apart from its protective function, carotin seems to be especially important, as providing during its photo-oxidation or partial disintegration the massive hydrocarbon combination in the phytyl radical of chlorophyll, whose addition is necessary to convert the dicarboxylic glaucophyllin into the tricarboxyll. Xanthophyll can be reduced to carotin by the aid of metallic reductases, but no oxidases have been found capable of converting carotin into xanthophyll. The oxidation of these substances in darkness or in feeble light differs in certain respects from that taking place in intense light.

"The oxidation of rhodophyllin, chlorophyll, xanthophyll, and carotin is more rapid at high temperatures than at low ones, and the rates of oxidation are in the order given, carotin being most readily oxidized. A rapid method is described of polymerizing formaldehyde to sugar, which has a definite end reaction, and yields calcium and sodium tartrates as by-products."

The author gives equations, not as representing established facts, but to indicate graphically how chlorophyll could act as a photic or lytase enzym for the conversion of carbon dioxid and water into carbohydrates. The chief difficulty in regard to them, as he notes, is the very large mass reactions which they represent. The first stage shows how amorphous chlorophyll+carbon dioxid and water would form xanthophyll (or carotin) oxygen and glaucophyllin. The second stage shows that carotin (or xanthophyll)+water+oxygen would equal phytol+levulose+glucose+formaldehyde. This reaction would take place in light with the aid of an oxidase enzym, and the excess oxygen from the first stage of the reaction escapes. In the third stage phytil, glaucophyllin, and carbon dioxid form amorphous chlorophyll and oxygen.

"This change would take place in the living plant with the aid of light energy. It makes the total volume of oxygen exhaled equal to the volume of carbon dioxid absorbed.

"This suggested cycle would indicate the enzymatic action of chlorophyll in the presence of water, carbon dioxid, and light, and might serve as a basis for further investigation . . . With an excess of carbon dioxid and a deficiency of light, stage 1 would preponderate. With stronger illumination stages 2 and 3 would balance 1. With excessive illumination and a deficiency of carbon dioxid, disintegratory photo-oxidation would take place, and the amount of chlorophyll would be reduced."

The recovery of vegetation at Kodiak, R. F. Griggs (*Ohio Jour. Sci.*, 19 (*1918*), *No. 1, pp. 1–57, figs. 32*).—This is an account of conditions and processes in the region affected by the eruption of Mt. Katmai, Alaska (E. S. R., 40, p. 812), as regards vegetation, and the revegetation of this area. Comparisons are made with other volcanic outbursts there and elsewhere.

It is stated that the damage to vegetation by an eruption is not likely to be so great as at first appears, no permanent injury to agricultural interests being probable in cases where the ash fall is not greater than 12 inches.

Hydrogen cyanid fumigation, E. E. Clayton (*Bot. Gaz., 67* (*1919*), *No. 6, pp. 483–500, figs. 2*).—A study has been made of normal green plants, chiefly tomatoes, growing under normal greenhouse conditions until exposed to hydrocyanic acid gas.

It has been found that different concentrations of HCN give effects ranging from stimulation to depression. The maximum of beneficial results occurred at a point fatal to insect life, but just below that of first injury to the plant. External factors increasing resistance are wetting the leaves, reduction of temperature, and reduction of light intensity during the day preceding fumigation. Injury closely paralleled amount of stomatal opening. Soil water supply influenced resistance by affecting growth rate, rapidly growing plants being more susceptible. Sugar content showed a positive correlation with resistance.

A modification of the Wright-Buchner anaerobic tube, R. R. Mellon (*Jour. Bact., 4* (*1919*), *No. 3, pp. 295–297, fig. 1*).—The author explains the advantages and employment of the method involved.

FIELD CROPS.

The words "productivity," or "productiveness," and "fertility" as applied to agriculture, C. V. Piper (*Jour. Amer. Soc. Agron., 11* (*1919*), *No. 9, pp. 342, 343*).—This paper, which is the fifth of a series of contributions to agronomic terminology, previously noted (E. S. R., 36, p. 827), comprises a brief discussion of the derivation and present generally accepted meanings of the words "fertility" and "productivity" or "productiveness as applied to agriculture." It is concluded that "in view of the fact that the word 'fertility' is often used in agriculture in the narrow sense of soil fertility or even of one of the theories of soil fertility as well as in its broader original meaning, it is an unsatisfactory and often ambiguous term to use in technical publications. 'Productivity' or 'productiveness,' both in their potential and actual applications, are words whose clearness has not been impaired by the evolution of ideas, and therefore they should be employed in preference to the word 'fertility' as used in its broad application."

Report of committee [of the American Society of Agronomy] on standardization of field experiments (*Jour. Amer. Soc. Agron., 11* (*1919*), *No. 9, pp. 350, 351*).—Supplementing a previous report (E. S. R., 40, p. 823), the committee states that "to what extent it may be desirable to unify methods is still an open question. The best information we have suggests that complete standardization will not be practicable nor desirable." They suggest that experimentation in methods be undertaken wherever possible in order to accumulate a mass of data from which a few fundamental standards may be derived.

Additions to the bibliography previously noted include eight titles.

Report of the committee [of the American Society of Agronomy] on varietal nomenclature (*Jour. Amer. Soc. Agron., 11* (*1919*), *No. 9, pp. 349, 350*).—This is a further report (E. S. R., 39, p. 833) on the standardization of varietal names and on the classification and registering of new introductions.

It is suggested that a new committee on the standardization of varieties be appointed, this committee to formulate a plan for testing and comparing standard types and new introductions. The functions of the committee would include the examination of proposed systems of classification and the adoption of a satisfactory system, the suggestion of necessary changes or modifications in classification, the testing of all standard types whenever practical in order to determine their relative adaptations, the appointment of a subcommittee to identify and properly classify for seedsmen or agronomists either old varieties or new introductions, and the providing of means for the proper registration and publication of new introductions.

Official field crop inspection, F. A. SPRAGG (*Science, n. ser., 51 (1920), No. 1309, pp. 113, 114*).—In a discussion of a paper on the subject by Bolley (E. S. R., 41, p. 536), the author maintains that a State-controlled seed inspection under the direction of the agricultural college, as advocated by Bolley, will in most cases be preceded by a cooperative seed growers' association. This is said to be due to the fact that after a superior variety has been developed a producing and selling agency must be formed in order to maintain a supply of the improved seed, and that the commercial aspect of such an organization bars it from direct association with the agricultural college. It is thought, however, that the college may legitimately aid in the inspection of pedigreed seed, both in the field and after it has been recleaned.

The conversion of winter into spring grain, C. FRUWIRTH (*Ztschr. Pflanzenzücht., 6 (1918), No. 1, pp. 1–46*).—The author describes rather extensive observations with wheat, rye, and barley in an effort to determine whether typical winter varieties could be changed over into spring sorts, either through adaptation to modified cultural practices or through breeding and selection.

Potash fertilization and lodging in cereals, C. KRAUS (*Landw. Jahrb. Bayern, 5 (1915), No. 5, pp. 259–305, figs. 2*).—Rather extensive experiments are described in which observations were made upon the effect of potash upon lodging cereals. It was concluded that potash aided in the development of stiff straw. See also a previous note (E. S. R., 41, p. 733).

Varieties of corn grown in Argentina: Native and acclimated varieties, O. D. GIROLA (*Variedades de Maiz Cultivadas en Argentina: Maices Argentinos y Aclimatados. Buenos Aires: J. Weiss y Preusche, 1919, pp. 165, figs. 68*).—The principal native and introduced varieties of corn grown in Argentina are briefly described and illustrated. Information relative to the cultural practices employed in growing the crop and to diseases affecting corn is included.

The chemical composition of the cotton plant, G. S. FRAPS (*Texas Sta. Bul. 247 (1919), pp. 5–17*).—Considerable tabulated data are presented showing the chemical composition of the cotton plant and its parts, based largely on analyses of four representative plants selected by the superintendents of the various substations and forwarded to the chemical laboratory of the State station. The results secured may be summarized as follows:

The average amounts of different parts of the plant which accompany 300 lbs. of seed cotton were found to be 588 lbs. of stalk, 446 lbs. of leaves, 313 lbs. of bolls, and 162 lbs. of burs, although there were large variations in individual cases. It is stated that larger yields of cotton would have been produced with practically the same amount of parts of the plant if seasonal conditions had been more favorable. Where yields of from 1,000 to 1,200 lbs. seed cotton per acre were obtained, the amount of stalk per 300 lbs. of seed cotton was about 350 lbs., of leaves 150 lbs., of bolls 50 lbs., and of burs 160 lbs.

The phosphoric acid used per 300 lbs. seed cotton varied from 3.1 to 18.1 lbs., with an average of 8 lbs.; potash from 9.4 to 72.6 lbs., with an average of 27 lbs.; and nitrogen from 14.6 to 78.8 lbs., with an average of 32.3 lbs. With yields of from 1,000 to 1,200 lbs. of seed cotton, about 5 lbs. of phosphoric acid, from 9 to 18 lbs. of potash, and from 15 to 25 lbs. of nitrogen were used per 300 lbs. of cotton seed. With a yield of less than 1,000 lbs. seed cotton per acre, the amount of mineral taken from the soil per 300 lbs. seed cotton was proportionately greater, while the plant was larger in proportion to the yield and sometimes formed bolls which did not produce cotton. An excess of potash may be taken up by the cotton plant.

The probable needs of cotton per 300 lbs. seed cotton or 100 lbs. lint are estimated to be 7 lbs. phosphoric acid, 25 lbs. nitrogen, and 15 lbs. potash. The draft on the soil was not found to be in direct proportion to the size of the crop, but was somewhat larger for small crops and somewhat less for large crops.

Cotton leaves were moderately high in protein (15.58 per cent), high in ether extract (7.44 per cent), and moderate in crude fiber (9.93 per cent), and are regarded as having a good feeding value. Empty burs, which are found around gins, are said to contain some seed, and to have a feeding value probably a little higher than that of cottonseed hulls.

The Bourbon palm of South Annam and its fiber, M. P. BUSSY (*Bul. Agr. Inst. Sci. Saigon* [*Cochin China*], *1* (*1919*), *No. 12*, *pp. 377–380*).—This comprises a brief discussion of the fiber obtained from the petioles and leaves of the so-called Bourbon palm (*Corypha lævis*).

[Paper-making materials] (*Bul. Imp. Inst.* [*So. Kensington*], *17* (*1919*), *No. 2*, *pp. 141–159*).—Supplementing similar work previously noted (E. S. R., 40, p. 823), this comprises an account of investigations made by the Imperial Institute of a number of materials from South Africa, Rhodesia, Egypt, Papua, and St. Helena in an effort to ascertain their suitability for the manufacture of paper. The materials include *Cymbopogon* spp., *Trachypogon polymorphus*, *Themeda forskalii mollissima*, *Tristachya rehmanni*, and *Panicum obscurens* from South Africa; muguguboya bark and mungongo wood (*Ricinodendron rautanenii*) from Rhodesia; stems of *Cyperus alopecuroides* and *C. papyrus* from Egypt; lalang grass (*Imperata arundinacea*) from Papua; and so-called thatching grass from St. Helena.

[Potato experiments in Bavaria], L. KIESSLING (*Landw. Jahrb. Bayern*, *7* (*1917*), *No. 10*, *pp. 739–754*).—This describes work conducted during 1914–1916, inclusive, embracing observations on the influence of size of seed tuber on yield, the effect of cutting the tuber, tests of early varieties, and selection experiments with potatoes.

A study of the rice of the Kamerun, F. HEIM (*Bul. Agence Gén. Colon.* [*France*], *12* (*1919*), *No. 142*, *pp. 569–574*).—This reports the analysis of three varieties of rice from the Kamerun, and presents a tabular statement showing the composition of 15 other sorts from different sources.

Effect of inoculation and lime on the yield and on the amount of nitrogen in soy beans on acid soil, E. B. FRED and E. J. GRAUL (*Soil Sci.*, *7* (*1919*), *No. 6*, *pp. 455–467*, *fig. 1*).—In this paper, a contribution from the Wisconsin Experiment Station, the authors describe pot and field experiments carried out with soy beans on Plainfield sand from Sparta and Hancock and on Colby silt loam from Marshfield and Curtiss in a study of the influence of additions of limestone and of inoculation with nodule bacteria upon the yield and composition of soy beans. Observations were also made on changes in the nitrogen supply of the soil. The results secured may be summarized as follows:

In every test the percentage of protein in the tops was higher in the nodule-bearing plants than in the plants free of nodules. Although the absence of the nodule bacteria renders it impossible for the soy bean plant to utilize the nitrogen of the air the effect is not always apparent, and in parts of Wisconsin soy beans will produce large crops in the absence of the nodule bacteria. In such cases the entire nitrogen supply of the plant is taken from the soil.

Inoculation of soy beans grown on sand from Sparta increased the yield of dry matter, while the yield was further increased when inoculation was supplemented by an application of lime. Sufficient lime to neutralize one-half of the active soil acidity produced maximum yields. The percentage of nitrogen in the crop and the total amount was also increased by inoculation.

Crops grown on sand from Hancock yielded better when inoculated than when uninoculated, inoculation being more effective in increasing the yield than lime. Small amounts of lime and inoculation together produced the best yields. The nitrogen content of the inoculated crop was considerable higher than that of the uninoculated crop.

It is stated that when the entire crop is removed from the soil, leaving only the roots and stubble, there will be less nitrogen in the soil than before the crop was grown, but if a properly inoculated crop is turned under as a green manure it will add large quantities of nitrogen to the soil.

Inoculation was not found to be as effective in increasing yields on Colby silt loam as on the sandy soils, although it influenced the percentage of nitrogen and consequently the total amount in the crop.

"Soy beans if properly inoculated will utilize nitrogen from the air and thus enrich the soil, provided the crop residue is returned to the soil. It is not necessary to plow the crop under if the crop is fed on the farm. The manure can be returned to the soil, and in this way be utilized in the improvement of the land. Small additions of limestone to acid soils render the inoculated soy bean plant more active in absorbing air nitrogen."

Report on the condition of the European beet sugar industry, H. J. DE MESA (*La. Planter, 64 (1920), No. 1, pp. 12, 13*).—This describes the present condition and future prospects of the industry in Poland, Russia, Czecho-Slovakia, Germany, Austria, Hungary, and France, with particular reference to its bearing on the cane sugar industry of Cuba. It is concluded that European sugar beets will not seriously compete with Cuban sugar cane for some time to come.

Manurial experiments with sugar cane, H. A. TEMPANY (*Dept. Agr. Mauritius, Gen. Ser., Bul. 14 (1918), [English Ed.], pp. 28*).—This describes fertilizer experiments with sugar cane conducted during the period of 1913–1918 at various experimental centers in Mauritius. In summarizing the results, the author states that the fundamental basis in maintaining the fertility of sugar-cane land is the application of pen manure in sufficient quantity to supply an adequate amount of organic matter in addition to plant food constituents. The economical use of commercial fertilizers under conditions where a large amount of pen manure is available is said to depend largely upon local conditions.

In these experiments increased yields followed the application of commercial fertilizers when they were used in addition to pen manure, although some of the increases were within the mean probable error. Sulphate of ammonia appeared to give the best results, on the whole, although nitrate of soda also showed satisfactory increases, while dried blood was less satisfactory. The addition of potash and phosphate usually increased the yield, but when these were used alone the results were generally disappointing. The effects of the fertilizers were about equally marked on ratoon cane as on plant cane, and on low lands as on high land. The application of molasses resulted in an appreciable increase in yield in most cases, while the effect of lime was less regular. The systematic irrigation of plats treated with nitrogenous fertilizers led to marked increases in yield.

Fertilizer experiments with sugar cane [at Tucumán], W. E. CROSS (*Rev. Indus. y Agr. Tucumán, 9 (1919), No. 11–12, pp. 170–178, fig. 1; trans. in Sugar*

[*New York*], *21* (*1919*), *No. 12, pp. 633, 634, 651*).—This describes the continuation during 1918 and 1919 of work previously noted (E. S. R., 41, p. 533).

The application of stable manure resulted in increased yields of cane in the case of P. O. J. 36, but so delayed the maturity of the cane that the yield of sugar from the fertilized plat exceeded that of the unfertilized plat by only a small margin. Sulphate of ammonia again gave very satisfactory results. Increased yields of cane and of sugar were obtained from the use of cowpeas as a green manure crop. Observations on the value of nitrogenous fertilizers in combating a root disease of sugar cane indicated that considerable improvement followed the use of sodium nitrate and sulphate of ammonia, while stable manure also gave beneficial results, although to a less marked degree.

Tucumán sugar canes in 1919, W. E. Cross (*Rev. Indus. y Agr. Tucumán, 9* (*1919*), *No. 11–12, pp. 161–167, fig. 1; abs. in La. Planter, 63* (*1919*), *No. 22, pp. 349, 350, fig. 1*).—Observations on cane varieties grown from seedlings produced in Tucumán during 1917 and 1918 are briefly noted. It is stated that a number of nurseries have been established in frost-free sections of northern Argentina, where it is hoped to procure seedling canes from seed produced in Argentina by specially selected canes.

Further trials with the cultivation of Réunion tobacco, H. A. Tempany and G. G. Auchinleck (*Dept. Agr. Mauritius, Gen. Ser., Bul. 15* (*1919*), [*English Ed.*], *pp. 20*).—Experimental and large-scale tests of growing Réunion tobacco in Mauritius, supplementing work previously noted (E. S. R., 40, p. 442), are said to prove definitely that this type of tobacco can be successfully grown in the island, and that it yields a product well suited to local requirements.

Wheat growing in Wisconsin, E. J. Delwiche and B. D. Leith (*Wisconsin Sta. Bul. 305* (*1919*), *pp. 18, figs. 7*).—The adaptation of the crop to various types of soil in the State is indicated, and cultural methods and field practices deemed best for growing wheat in Wisconsin are described. Based on variety tests reported, covering a number of years and conducted in different parts of the State, Turkey Red (Pedigree No. 2), winter wheat, and Marquis (Wisconsin No. 50), spring wheat, are recommended for the southern part of the State; and Turkey Red and Bacska (Pedigree No. 408), winter varieties, and Red Fife and Marquis, spring varieties, for the northern section.

Wheat in East Africa, W. J. Dowson (*Dept. Agr. Brit. East Africa Bul. 4* (*1919*), *pp. 16*).—This is a rather popular account of the cultural methods and field practices employed in growing the crop in British East Africa.

HORTICULTURE.

Manual of gardening in New Zealand, D. Tannock (*Christchurch, New Zeal., and London: Whitcombe & Tombs, Ltd., pp. 298, pl. 1, figs. 106*).—A manual of information relative to the planting, culture, and care of all kinds of ornamentals, vegetables, fruits, and nuts in New Zealand, including special chapters on Hardy Bulbs and Garden Foes, by A. E. Lowe; on Vegetable and Fruit Growing, by W. Sinclair; and on Rose Growing for Exhibition, by R. Nicoll.

A little garden the year round, G. Teall (*New York: E. P. Dutton & Co., 1919, XV+227, pls. 17*).—A popular treatise on ornamental and vegetable gardening, including chapters on the culture and care of indoor plants.

Forcing vegetables in hotbeds, J. Böttner (*Die Frühbeettreiberei der Gemüse. Frankfort on the Oder: Trowitzsch & Son, 1917 pp. 119, figs. 92*).—A treatise on hotbed practices, including specific directions for growing the more important vegetables.

Mushroom culture (*Champignon Culture Rationelle. Paris: Libr. Larousse, pp. 32, figs. 15*).—This pamphlet contains practical instruction for commercial mushroom culture, including chapters on diseases and other enemies, poisonous mushrooms, and methods of cooking and conserving.

Growing tomato seed, W. W. Tracy (*Seed World, 7 (1920), No. 3, pp. 18, 19, fig. 1*).—A paper on this subject delivered before the National Canners' Association, Cleveland, on January 29, 1920.

Seed farming in Britain, A. J. Macself (*Burnley, England: Hortus Printing Co., Ltd., 1919, pp. 32*).—A small practical treatise on the cultivation of vegetables for the production of seeds.

The nursery-manual, L. H. Bailey (*New York: The Macmillan Co., 1920, pp. XI+456, pls. 12, figs. 226*).—A new edition of the author's Nursery-Book (E. S. R., 8, p. 602) completely revised and reset.

The recognition of fruit: Graphic records, H. E. Durham (*Jour. Pomol., vol. 1, No. 1, pp. 28–36, figs. 3*).—The author calls attention to the faulty illustrations and drawings which frequently accompany the descriptions of fruits, and presents details for making simple graphic records with special reference to apples and pears.

Timely measures for grafting old fruit trees, F. Schönberg (*Zeitgemässe Masznahmen beim Umpfropfen Älterer Obstbäume. Stuttgart: Eugen Ulmer, 1917, pp. 41, figs. 45*).—In this small work the author describes and illustrates proper and improper methods of shaping and top-working old fruit trees, with special reference to the apple and pear.

Pruning trees to bearing age, W. P. Tufts (*Blue Ribbon Peach News, 1 (1920), No. 1, pp. 5, 26, 27, figs. 10*).—Practical observations on the pruning and shaping of young fruit trees, based on pruning studies conducted by the author at the California Experiment Station (E. S. R., 42, p. 138).

The bush fruit: Quickly remunerative fruit-growing by simplified methods, J. Böttner (*Das Buschobst: Schnell Lohnende Obstzucht nach Vereinfachtem Verfahren. Frankfort on the Oder: Trowitzsch & Son, 1918, pp. 5+112, figs. 75*).—A treatise on the culture of orchard fruit trees in the form of bushes.

A possible method of retarding the flowering of fruit trees, F. Dienert (*Rev. Vitic., 51 (1919), No. 1328, pp. 379, 380*).—Chlorin gas was liberated in the vicinity of a cherry tree and a peach tree. The gas attacked the trees and they appeared to be completely scorched and destroyed. However, the trees came into bloom late in the season and set fruit, hence the author suggests the possible utilization of chlorin and other asphyxiating gases for retarding the blooming period of fruit trees, with the view of producing fruit after the normal season.

Report on tests of self-sterility in plums, cherries, and apples at the John Innes Horticultural Institution, I. Sutton (*Jour. Pomol., Vol. 1, No. 1, pp. 1–19*).—A reprint of the investigations previously noted (E. S. R., 40, p. 148).

A study of sterility in the plum, M. J. Dorsey (*Genetics, 4 (1919), No. 5, pp. 417–488, pls. 5*).—A contribution from the Minnesota Experiment Station continuing previous work relative to unfruitfulness in the plum (E. S. R., 41, p. 445). Cytological studies were made of pollen and pistil development in a representative group of plum varieties and hybrids. The various stages of development are described and discussed with the view of throwing some light on inherent causes of the self-sterility, which occurs uniformly among the varieties of American species of plum. A bibliography of cited literature is given.

The author found that pollen development under Minnesota conditions proceeded no farther in the fall than the archesporial-cell stage, and growth in the spring began about April 1. The tissues of the mature anther developed and functioned normally so that there appeared to be influences from this source which would contribute to pollen abortion. Normal pollen development was typical in the group of plums studied. While many aborted grains were found in all varieties studied, and in some supposedly pure species, pollen abortion was not a cause of sterility except in rare instances where suppression was complete. The percentage of aborted pollen was higher in hybrids than in species supposed to be pure. In many of the hybrids pollen was found to break up into yellowish, oily globules, thus accounting for the fact that pollen of some varieties is "sticky" at dehiscence and is not readily blown away by the wind. Stamens may metamorphose into either petals or pistils, but in the anthers affected new types of aborted pollen were not found. In general neither self- nor cross-sterility could be explained upon the basis of pollen abortion.

Pistil development in the fall showed no evidence of the growing point from which the ovule is formed. At bloom the ovary may contain two ovules in each of which there are four to eight nuclei. Typically, either before or soon after bloom one of the ovules was suppressed, but many variations were found in the degree of growth before suppression. Pistils were found to drop in three waves, separate and distinct in point of time and size. The first drop, in which all of the pistils were aborted, occurred immediately after bloom. Flowers bearing aborted pistils generally bore normal pollen. The second drop occurred two to four weeks after bloom, and included all pistils in which, for any reason, fertilization had not taken place. In pistils which fell at this time the ovaries had attained a size of 2 to 5 mm. The third or "June drop" followed the second by an interval of about two weeks. The plums were larger than in the second drop and fertilization had taken place, but embryo development had stopped.

Controlled plum crosses of different combinations were found to set different percentages of fruit. In some crosses no fertilization took place and all pistils fell in the second drop, in other crosses fertilization occurred but either a part or all of the pistils dropped. In general, all varieties studied were found to be self-sterile, some cross-sterile, and others cross-fertile. The type of sterility, either self or cross, was found to be that termed incompatability, in which gametic fusion is prevented by slow tube growth. Some pollen grains, apparently normal, failed to germinate under the conditions of the stigmatic fluid, while others developed pollen tubes under similar conditions. These differences are attributed to something inherent in the grains rather than in their substratum, which either in the case of another sap or stigmatic fluid may be regarded as homogeneous throughout. This condition can be explained by differences in genetic constitution.

A study of the formation and development of the flower buds of Jonathan and Grimes Golden in relation to different types (clover sod, blue grass sod, cover crop, and clean tillage) of soil management, R. S. KIRBY (*Proc. Iowa Acad. Sci., 25 (1918), pp. 265–289, figs. 12*).—A progress report of studies being conducted at the Iowa Experiment Station (E. S. R., 40, p. 148). A bibliography of related literature is included.

The data here presented show that the formation and development of flower buds of the Jonathan and Grimes Golden varieties subjected to four types of soil management were associated with a number of factors, of which the most important appeared to be the amount of soil moisture. This also affects the growth of the trees and probably the size of the crop at the same time as it affects the formation and development of flower buds.

"Flower buds were formed, that is, differentiated from leaf buds, earlier on sod plats than on plats receiving some cultivation each year. The earliest time at which flower buds were formed occurred on clover sod with a low percentage of soil moisture. Flower buds formed earlier on a clover sod than on a blue-grass sod having slightly less soil moisture. On the other hand, flower buds formed earlier on a blue-grass sod than on a clover sod having about 2.5 per cent more soil moisture. These facts indicate two things, first, that the addition of nitrates in the clover sod causes the flower buds to form earlier; and second, that the amount of soil moisture is a very important if not the chief external factor in determining the time at which flower buds form.

"The formation of flower buds began about the first of July on the plats where it occurred earliest and extended until the middle of September on the plats where it occurred latest, thus occupying a period of about 2.5 months. The time occupied by each tree in forming flower buds was about four weeks. Trees in sod produced the largest proportion of flower buds, and those in clover sod, which supposedly contained the most nitrates, produced a much larger proportion of flower buds than those in blue-grass sod. The period covering the time during which the different trees formed and developed their flowers extended from about July 1, 1916, to May 17, 1917, thus being about 10 months in length.

"Apple flowers have two periods of rapid growth. The first one immediately follows the differentiation of the flower bud from the leaf bud, and during this period, which is about 6 weeks in length, the floral organs are differentiated. During the second period, which begins about 6 weeks previous to the opening and ends with the full expansion of the flower, the floral organs increase their size many times. During the time intervening between the two periods of rapid growth, growth continues but is slow."

Some promising new pear stock, B. T. GALLOWAY (*Jour. Heredity, 11 (1920), No. 1, pp. 25–32, figs. 8*).—Notes on some of the more promising oriental pear stocks introduced and now being tested by the Office of Foreign Seed and Plant Introduction of the U. S. Department of Agriculture.

The length of stem in pears and apples, E. A. BUNYARD (*Jour. Pomol., vol. 1, No. 1, pp. 20–22, fig. 1*).—The author presents some evidence to show that the length of stem can not be accepted as a very constant character, and is of little value in diagnosing varieties of pears and apples.

The strawberry and its cultivation in Canada, W. T. MACOUN (*Canada Expt. Farms Bul. 92 (1919), pp. 39, figs. 11*).—In the present revised edition of Bulletin 62 (E. S. R., 22, p. 738) sections on Insects Affecting the Strawberry, by the Entomological Branch (pp. 31–35), and Common Strawberry Diseases, by W. A. McCubbin (pp. 35–39), have been added.

Loganberries and Evergreen blackberries, J. L. STAHL (*Washington Sta., West. Wash. Sta. Mo. Bul., 7 (1920), No. 10, pp. 154–157*).—Concise directions are given for the culture and care of Logan and Evergreen blackberries.

Specialized mulberry culture, F. ZAGO (*Italia Agr., 56 (1919), No. 12, pp. 371–373, pl. 1*).—A discussion of methods of growing mulberries with reference to maximum leaf production for silkworm culture.

The fertilizing action of sulphur on grapevines, J. CHAUZIT (*Bul. Agr. Algérie, Tunisie, Maroc., 2. ser., 25 (1919), No. 12, pp. 295, 296*).—Continuing investigations previously reported (E. S. R., 31, p. 442), experiments were conducted to verify the effect of sulphur on vines which had received no fertilizer for two years, to compare the effects of sulphur and horse manure, and to determine the effect of sulphur mixed with horse manure.

The data secured confirm the author's earlier conclusion as to the general beneficial effect of sulphur on the yield of grapes. In view of the dry conditions subsequent to the various applications, a plat receiving horse manure at the rate of about 14 tons per acre yielded somewhat less than the check plat, whereas a plat receiving the same amount of stable manure plus 175 lbs. of sulphur per acre yielded much higher than the check plat. It appeared that the sulphur exerted a decomposing action on the stable manure, although no conclusion is thus far drawn as to the exact cause of the beneficial action produced by the sulphur. The experiments are to be continued.

Possible uses for wine-grape vineyards, F. T. Bioletti and W. V. Cruess (*Cal. State Bd. Vitic. Commrs. Bul. 14* (*1919*), *pp. 18*).—The methods proposed and listed here are of four types, shipping the fresh grapes to countries which do not prohibit wine making, utilization of grapes for other purposes, such as raisins, for home wine making; grape juice, grape sirup, vinegar, grape sugar, cream of tartar, etc.; grafting the vines with raisins and other table varieties; and replacing the vines with other crops.

On the chinin or coyo (Persea schiedeana), G. Itié (*Agron. Colon., 4* (*1919*), *No. 27, pp. 78–82, fig. 1*).—The author concludes that the chinin previously described by him as a peculiar form of avocado obtained from the State of Tabasco, Mexico (E. S. R., 40, p. 151) is synonymous with the coyo described by Popenoe in his report on the avocado in Guatemala (E. S. R., 41, p. 45).

Cinchona culture in Java, Lobliz (*Bul. Écon. Indochine, n. ser., 22* (*1919*), *No. 138, pp. 761–764*).—A concise statement of the adaptation of different varieties of cinchona to Java conditions, methods of propagation, planting, and care of plantations.

Selection of stocks in citrus propagation, H. J. Webber (*California Sta., Bul. 317* (*1920*), *pp. 269–301, figs. 14*).—This bulletin presents in detail the results secured in comparative tests with large, intermediate, and small nursery trees used as stocks for oranges and grapefruit. The results of these tests have been summarized in a previous paper by the author (E. S. R., 42, p. 140).

Strains of Satsuma oranges in the United States, L. B. Scott (*Proc. Gulf Coast Hort. Soc., 4* (*1918*), *pp. 3–8*).—A discussion of variation in the Satsuma orange based upon observations of the author and Tanaka previously noted (E. S. R., 40, p. 342). Instructions are given for keeping tree performance records similar to those used in Chamel's work with citrus fruits in California (E. S. R., 37, p. 144), with the view of eliminating worthless variations from the groves.

Rate of increase in temperature with altitude during frosty nights in orange groves in southern California, F. D. Young (*Cal. Citrogr., 5* (*1920*), *No. 5, pp. 136, 160, 161, figs. 3*).—A discussion of the factors which cause stratification of the lower air on cool, calm nights, including data showing what the actual extent of this stratification was found to be on certain representative nights in the Pomona Valley.

The data given show the minimum temperatures registered at 5-ft. levels on a 40-ft. tower on 44 cool nights during 1919 and 1920. The average temperature for the 44 nights at the 5-ft. level was 32.8° F. and at the 40-ft. level was 40.4°. This data was secured over relatively level ground. The author points out that on steep hillsides and at the bases of steep hills other factors enter into the problem, and the increase in temperature with altitude may be much more pronounced.

In view of the fact that efforts are being made to perfect some method whereby the warmer air of the upper stratas may be mixed with the cool air of the lower stratas, the author points out that if such a machine could be devised the effect on the temperature near the ground would be much less on a night with long continued extremely low temperature than on a night when the temperature fell steadily all night and a dangerous temperature was not reached until after midnight.

The coco palm or coconut tree, L. T. Maijer (*De Kokospalm of Klapperboom. Batavia: G. Kolff & Co., 1917, pp. 7+71, figs. 24*).—A monograph on the coco palm (*Cocos nucifera*), with reference to its botany, history, East Indian names of the various parts and products of the palm, varieties, soil requirements, details of culture, harvesting, preparation of copra, oil, fiber, and other products, the traditions of the Javanese relating to the coconut tree, the coconut tree and its products in the language of the people, and the importance of palm culture to the natives of Java.

Curing of vanilla beans (Vanilla planifolia) (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. St. Kitts-Nevis, 1917–18, pp. 28–31; also in Trop. Agr. [Ceylon], 53 (1919), No. 5, pp. 312–314*).—Experiments conducted at the St. Kitts-Nevis Botanic Station indicate that the practice of dipping the beans of *V. planifolia* in hot water prior to the sweating process can not be dispensed with. If hot water is not used the beans turn brown after some time, then black, and finally burst, the pleasant odor of cured vanilla being entirely absent.

The water should have a temperature of from 80 to 90° C. (176 to 194° F.) for the development of good aroma. Boiling water seems to destroy to some extent the action of the oxidase. Sweating the beans in glass-topped boxes, in which a temperature of 50° was maintained, gave good results. After sweating, the beans are allowed to dry slowly at room temperature, which takes about two weeks. They should then be packed in air-tight tins as soon as possible, otherwise much of the aroma is lost and they become somewhat hard.

The culture of medicinal plants, A. Goris and J. Demilly (*La Culture des Plantes Médicinales. Paris: Vigot Bros., 1919, pp. XI+143, figs. 29*).—The introductory chapter of this manual contains some general notes on the culture of medicinal plants and methods of preparing them for market. Each plant is then considered with reference to its distinguishing characteristics, uses, cultural requirements, and harvesting period.

Notes on the early history of the pecan in America, R. H. True (*Ann. Rpt. Smithsn. Inst., 1917, pp. 435–448*).—A contribution to the history of the pecan, gleaned largely from unpublished manuscripts and from old or rare works not easy of access. A reference list of cited literature is included.

Pecans, other than those of the well-known sections, J. F. Jones (*Amer. Nut Jour., 12 (1920), No. 2, pp. 25, 30*).—In this paper the author points out the unreliability of many southern varieties of the pecan when grown in the North, and suggests the utilization of Iowa-grown varieties for northern planting.

Diversification in orchards, W. C. Griffing (*Proc. Gulf Coast Hort. Soc., 1 (1915), pp. 25–34*).—The author suggests several fruit crops suitable for interplanting in pecan groves, and also gives a descriptive list of special varieties and classes of trees suitable for ornamental planting in the Gulf Coast region of the United States.

Street trees, F. L. Mulford (*U. S. Dept. Agr. Bul. 816 (1920), pp. 58, figs. 37*).—A treatise on street trees, their selection, culture, and care. Introductory considerations deal with the importance of shade trees, public control of street trees, planning for trees on city streets, spacing trees, conditions for tree growth, and kinds of trees suitable for city streets.

The United States is arbitrarily divided into 18 regions, and a list is given of trees of desirable varieties for street planting in each region. A descriptive list of the more important street trees is also given, together with details relative to the culture and care of trees. A list of publications of this Department relating to diseases and insects affecting shade and ornamental trees is appended.

Systematic tree planting in country planning, W. W. ANDREWS (*Canad. Forestry Jour., 16 (1920), No. 1, pp. 24, 25*).—A concise enumeration of the benefits to be derived by general traffic and by the farmer through the systematic protection of prairie roads and farms by tree planting.

Parks and gardens, G. and P. ADOLPHE-BELLAIR (*Parcs et Jardins. Paris: J. B. Baillière & Sons, 1919, pp. 382, figs. 227*).—A treatise on landscape gardening issued as one of the volumes of the Encyclopédie Agricole, published under the direction of G. Wery. Part 1 deals with the elements and materials of the landscape garden, and part 2 with the principles and practice of landscape gardening.

FORESTRY.

Forests, woods, and trees, A. HENRY (*London: Constable & Co., Ltd., 1919, pp. XII+314, pls. 21, figs. 21*).—In the introductory chapters of this book the author considers the influence of forests on climate, stream flow, soil erosion, wind, and purity of air and water. The value of forest districts as sites for sanatoria, and the history and utility of parks, open spaces, and trees in towns are then discussed. The concluding chapters of the book are devoted to a study of the afforestation of the important water catchment areas in Great Britain and Ireland, including a descriptive list of trees suitable for planting in these areas and for general planting.

Report of the director of the National Park Service to the Secretary of the Interior for the fiscal year ended June 30, 1919, S. T. MATHER (*U. S. Dept. Int., Rpt. Div. Natl. Park Serv., 1919, pp. 384, pls. 35, figs. 6*).—A report on the administration, protection, improvement, public use, and revenues of the U. S. National Park system for the year ended June 30, 1919, including a summary of conditions in each park and monument, their important needs, plans for future development, and recent and pending legislation relating to the park system. The report is accompanied by several appendixes containing the reports of officers in charge of each park, as well as maps, statistics, legislation, bibliographies, and miscellaneous information relative to the parks.

Annual report of the director of forestry of the Philippine Islands for the fiscal year ended December 31, 1918, A. F. FISCHER (*Ann. Rpt. Dir. Forestry P. I., 1918, pp. 83, pls. 5*).—A report for the year on activities of the divisions of forest management, investigation, sawmills and utilization, forest lands and maps, and administration, the office of the wood expert, and the forest school, including recommendations relative to needed legislation. Statistical data relative to land applications, timber licenses, yield of major and minor forest products, revenues, and expenditures for the year are appended.

Report on forest administration in Burma for the year ended June 30, 1918, H. CARTER (*Rpt. Forest Admin. Burma, 1918, pp. III+5+114, pl. 1*).—A report on the administration and management of the State forests in Burma for the year ended June 30, 1918. Important data relative to alterations in forest areas, forest surveys, working plans, production, grazing operations, yields in major and minor forest products, revenues, expenditures, etc., are appended in tabular form. A glossary of vernacular or local names and expressions used in the report is included.

National forest range improvement and development, J. H. HATTON (*Producer, 1 (1920), No. 9, pp. 9–12, figs. 3*).—This paper gives a brief résumé of the activities of the Forest Service of the U. S. Department of Agriculture, with reference to the regulation of grazing, the construction of range improvements, and the artificial reseeding of ranges.

Economy and efficiency in handling forest products a national necessity, A. P. NELSON (*Cong. Rec., 59 (1920), No. 63, pp. 3626–3828*).—A résumé of the scope of the work of the Forest Products Laboratory at Madison, Wis., with special emphasis on the national importance of this work.

What our forests support, F. H. SMITH (*Amer. Forestry, 26 (1920), No. 313, pp. 16, 17*).—A brief survey as to the nature and extent of the various industries dependent upon the forest resources of the country.

The forest resources of Virginia, R. C. JONES (*Va. Geol. Comm., Off. State Forester Bul. 19 (1919), pp. 11*).—A brief general statement as to the character, amount, value, and condition of the forest resources of Virginia, with a warning as to the destructiveness of present forest practices and the necessity of rational forest management both by the State and by private owners.

Plain statements on Canada's forests, F. J. D. BARNJUM (*Canad. Forestry Jour., 16 (1920), No. 1, pp. 27–31, figs. 3*).—A discussion of the limitations of Canada's wood supply, together with suggested remedies.

Forestry legislation in Canada during 1919, F. W. H. JACOMBE (*Canad. Forestry Jour., 16 (1920), No. 1, pp. 33, 34*).—A résumé of forestry legislation concerning Dominion and Provincial forest lands in 1919.

Forestry and rural policy, J. S. MAXWELL (*Trans. Highland and Agr. Soc. Scot., 5. ser., 31 (1919), pp. 67–93, figs. 6*).—In this paper the author discusses the factors that have led to the neglect of forestry in the British Isles and particularly in Scotland, and points out the effect of the war in depleting the timber reserves of Scotland. He then presents the essential factors of the forest policy for the United Kingdom as developed by the Reconstruction Committee, and discusses these factors with special reference to their application to Scottish conditions.

The forest policy of France, W. B. GREELEY (*Amer. Forestry, 26 (1920), No. 313, pp. 3–9, figs. 7*).—This article deals particularly with the control of sand dunes and mountain torrents in France. It is based upon material taken largely from Cours de Droit Forestier, by C. Gugot, and from data prepared by G. Garbe.

The forest situation in modern Greece, C. G. SKLAWUNOS (*Forstwiss. Centbl., 41 (1919), Nos. 3, pp. 81–90; 5, pp. 173–184; 7, pp. 249–264*).—An account of the forests of Greece with reference to their extent, distribution, ownership, and component species; forest policy, protection, the timber industry; and exports and imports.

Note on the vegetation of Cyrenaica and on its agricultural utilization, A. MAUGINI (*Agr. Colon.* [*Italy*], *13 (1919), No. 12, pp. 515–546, figs. 8*).—A descriptive account of the physical features and vegetation of the territory of Cyrenaica, in northern Africa, with special reference to the pastures and woods. A list of collected plants is included.

Rate of growth of indegenous and exotic trees in New Zealand, E. MAXWELL (*New Zeal. Jour. Sci. and Technol., 2 (1919), No. 6, pp. 371–376, fig. 1*).—Data are given showing the rate of growth in New Zealand of indigenous trees as compared with the rate of growth of exotic trees there and with the rate of growth of foreign trees in foreign countries. Data are also given showing the rate of growth of 34 specimens of Eucalyptus of value for timber.

In view of the fact that several of the commercially important foreign species attain marketable size in a much shorter time than the important native species, the author concludes that it would be a hopeless undertaking to attempt to provide even a small portion of the future timber needs of the country by growing native trees.

The germination of some trees and shrubs and their juvenile forms, L. H. PAMMEL and C. M. KING (*Proc. Iowa Acad. Sci., 25 (1918), pp. 291–340, figs. 76*).—In continuation of a similar study of oaks (E. S. R., 40, p. 47), data are given on germination tests on a number of trees and shrubs, together with descriptions and illustrations of their seedling forms.

The reproductive organs of Hevea brasiliensis, C. HEUSSER (*Arch. Rubbercult. Nederland. Indië, 3 (1919), No. 11, pp. 455–514, figs. 15*).—Results are presented of a morphological and cytological study of the reproductive organs of *Hevea brasiliensis*. In addition to the descriptive text various phases of the study are presented in a series of plates. A bibliography of cited literature is included.

DISEASES OF PLANTS.

Recent literature on fungus diseases of plants, L. H. PAMMEL (*Trans. Iowa Hort. Soc., 53 (1918), pp. 185–225*).—A condensed account is given of the literature relating to plant diseases as noted by the author during the year. The several sections include information relating to diseases of apple, pear, quince, potato, tomato, root crops, vegetables, fruit and forest trees, cereals, and forage crops, also miscellaneous diseases and other forms of injury. An account is also given of remedial measures.

A discussion of systematic papers is followed by a short sketch history of phytopathology.

Botany and plant diseases, F. C. STEWART (*N. Y. State Hort. Soc. Proc., 1 (1919), pp. 19–24*).—Winter injury is briefly discussed as noted following the severe conditions of 1917–18.

The unusually succulent condition of peach twigs in the fall may, it is thought, have had something to do with what is termed spray injury following fall application of soluble sulphur and the use of lime sulphur at a strength suitable for scale. Recent literature on fruit diseases is indicated and briefly discussed.

[Experimental work with plant diseases, Ontario], W. H. HEARST (*Rpt. Min. Agr. Ontario, 1917, pp. 60–62*).—Bordeaux mixture appears to be of little utility as against onion blight. Combined with Black Leaf 40, it gives hope of controlling celery black heart through its destructive effects on the tarnished plant bug, which is believed to be responsible for injury leading to infection resulting in this disease.

Lime sulphur dust and lead arsenate in dust form applied over a limited potato area gave an increased yield of cleaner and larger tubers. The use of dust mixtures is recommended for celery blight, but formalin was not successful after this disease was once well started.

Experiments with soil treatment practically amounting to partial sterilization are being tested out in various greenhouses in the Province.

Botany [Ontario, 1917] (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 43 (1917), pp. 24–31*).—Attention is given in this report mainly to such diseases of potato as late blight, leaf roll, mosaic, and curly dwarf; to celery late blight; to seed oats treatment with formalin; to snapdragon rust; to white pine blister rust; and to a peculiar disease of winter tomatoes.

Report of the mycologist, R. H. BUNTING (*Govt. Gold Coast, Rpt. Agr. Dept., 1917, pp. 19–21*).—Cacao brown pod showed an increase at Aburi. Spraying results were not decisive. White thread was particularly prevalent on cacao growing in clay soil and under forest shade.

The Liberian coffee fruit disease, which advances rapidly in the wet season, does not attack other species of coffee growing near infected *C. liberica*. Bordeaux mixture checks the disease, but its use is not economical. The causal organism has been determined as a new species of Muratella, and is to be described later under the name *M. coffeæ*.

Para rubber shows a disease resembling that described usually as stripe canker, and associated with the same fungus (*Phytophthora faberi*.). The latex yield is considerably affected. Treatments with solutions of creosote and with lysol were too expensive for practical purposes. A 20 per cent carbolineum treatment is recommended. Leaf disease (*Helminthosporium heveæ*) caused much damage in one place by defoliation.

The peanut crop was practically destroyed at Aburi and Peki by *Cercospora personata* and by bunching disease, the cause of which is not yet known. Sweet potato was seriously attacked by a fungus corresponding mainly to *Lasiodiplodia tubericola*. *Hymenochæte noxia* fatally attacked *Cedrela odorata*, *Coffea robusta*, *Anona muricata*, and *Persea gratissima*. *Polyporus lignosus* caused the death of a specimen of *Melia azadirachta*. *Hemileia* n. sp. caused damage to *Strophanthus hispidus* at Aburi. A description will be published later. A brief account is given of the facts ascertained in connection with the general sanitation of cacao as related to protection from diseases and to yield from recovered plants.

The present state of grain treatment for cereal diseases, L. Hiltner (*Landw. Jahrb. Bayern, 8 (1918), No. 4–5, pp. 173–206*).—A report is made regarding the various plans, methods, and practices designed to minimize the injurious effects of seed-borne cereal diseases.

[Fungicidal treatment of cereal seed], G. Irlbach (*Landw. Jahrb. Bayern, 8 (1918), No. 4–5, pp. 206–210*).—This is a more condensed account than that of Hiltner above noted of the treatments for seed-borne cereal diseases.

The extermination of the common barberry to prevent crop leakage due to stem rust, L. H. Pammel (*Trans. Iowa Hort. Soc., 53 (1918), pp. 401–408*).—An account is given of the relation of barberry to stem rust of wheat and oats and of the measures during and since 1917 to eradicate the barberry hosts.

Formaldehyde treatment of seed corn, F. D. Richey (*Jour. Amer. Soc. Agron., 12 (1920), No. 1, pp. 39–43*).—This paper, a contribution from the U. S. Department of Agriculture, describes observations on the effect upon germination of treating seed corn with formaldehyde solutions of different strengths and for different periods in an effort to prevent the growth of fungi on the seedlings grown in water cultures. Germination tests were made both in water cultures and in sand.

"Treatment of seed corn with solutions of 5, 15, and 25 cc. of formaldehyde per liter materially reduced the development of fungi on the plants grown in water culture. The vitality of the seed, as evidenced by the development of the seedlings in either water culture or sand, was not affected by treatment with the solution of 5 cc. of formaldehyde per liter. Treatment with the solution of 15 cc. of formaldehyde per liter did not materially affect the seedlings grown in water culture, but nevertheless was injurious, as evidenced by the germination and development in sand. Treatment with 25 cc. per liter was markedly deleterious . . . Soaking seed corn for two hours in a solution of 5 cc. liquor formaldehyde in 995 cc. of water, followed by a fuming period of from 2 to 24 hours, can therefore be recommended as checking fungus development without interfering with the normal development of corn seedlings in water culture."

A preliminary study of the inheritance of rust resistance in oats, J. H. Parker (*Jour. Amer. Soc. Agron., 12 (1920), No. 1, pp. 23–38, pls. 2*).—This paper, a contribution from the U. S. Department of Agriculture, describes work conducted at Cornell University in a study of the genetic behavior of rust resistance in pedigree lines and in a large number of F_2 generation hybrids of Burt and Sixty-Day oats. The methods of seeding, inoculating, and recording the observations were the same as those previously noted (E. S. R., 38, p. 849). Most of the inoculations were made on seedlings, although a sufficient number were made at time of heading to demonstrate that the results were similar. The rusts employed included the crown or leaf rust of oats (*Puccinia lolii avenæ*) and the stem rust of oats (*P. graminis avenæ*). The results secured may be summarized as follows:

Burt and Sixty-Day and all hybrids of these varieties so far tested were found to be entirely susceptible to stem rust. All plants of Sixty-Day also were uniformly susceptible to crown rust, while of 223 inoculated plants of Burt, 48 were classified as resistant, 152 as intermediate, and 23 as susceptible.

Each of five hybrid families contained, in the F_2 generation, some plants showing a high degree of resistance to crown rust and others which were as susceptible as plants of the Sixty-Day parent, while a rather large number was classified as intermediate, showing varying degrees of resistance. The numerical results of inoculations of 468 seedlings made in the F_2 hybrids were as follows: Classified as resistant, 81; classified as intermediate, 61; and classified as susceptible, 326. These results are held to indicate that susceptibility to crown rust in this cross is partially dominant, while resistance is recessive. This behavior is not thought to be due to environmental conditions or to differences in the metabolism of the host but to definite genetic factors, although nonhereditary factors may influence or modify it.

It is stated that rust resistance and susceptibility can hardly be considered as simple characters or as being determined by a single factor difference, the F_2 results favoring the view that several factors are involved, i. e., the multiple factor hypothesis. No attempt has been made to construct a definite factorial hypothesis to explain the results obtained.

This preliminary work has proved the possibility of transferring resistance to crown rust from the Burt variety to plants of the F_2 generation of a Burt× Sixty-Day cross, suggesting a further use of the method of hybridization in the effort to produce rust-resistant varieties of oats.

A list of 19 references, comprising the literature cited, is appended.

Potato diseases in Hawaii and their control, C. W. Carpenter (*Hawaii Sta. Bul. 45 (1920), pp. 42, pls. 15, figs. 7*).—A study has been made of some of the causes of potato crop failures in Hawaii, and the author states that they are due largely to the use of poor seed, continuous cropping, diseases and insect pests, and unsatisfactory soil conditions. The following diseases and insect pests of the Irish potato are reported as present in Hawaii: Fusarium wilt (*Fusarium oxysporum*), late blight (*Phytophthora infestans*), early blight (*Alternaria solani*), black scurf and rosette (*Rhizoctonia solani*), Sclerotium wilt (*Sclerotium rolfsii*), common or corky scab (*Actinomyces chromogenus*), tuber rots (*P. infestans, F. oxysporum, F. radicicola, and F. cæruleum*), tuber moth (*Phthorimæa operculella*), cutworms, mite disease, and nematodes (*Heterodera* sp.); and the nonparasitic troubles sunscald, sunburn of tubers, leaf tipburn, hollow potato, pronged potatoes, and arsenical injury. For the improvement of the potato industry the author recommends the universal adoption of the practices of seed selection and disinfection, crop rotation, and spraying with Bordeaux mixture.

A further report on the value of dusting v. spraying to control fruit tree insects and fungus diseases, L. Caesar (*Ann. Rpt. Ent. Soc. Ontario, 48 (1917), pp. 79–85*).—A series of experiments carried out in 1917 similar to that noted for the previous year (E. S. R., 37, p. 832) is reported.

There was little difference as to cost of dusting as opposed to spraying in case of large trees, but the spray is the cheaper with small trees. The liquid spray is preferred until such time as improved dust substitutes or dusting machinery or both are available.

Field and investigation work [on fruit diseases and insects in Ontario] (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 43 (1917), pp. 20–24*).—In this report it is stated that a second year's test of the dust method of spraying for fruit insects and plant diseases has been made. The liquid appeared to be the better form for apple scab. It is thought that spraying may be better for the average fruit grower.

Brown rot of sweet cherry is satisfactorily controlled with a series of four treatments. The trees are sprayed a day or two before the buds open with lime sulphur of specific gravity 1.035; again after the blossoms fall with lime sulphur of specific gravity 1.008; with the same just as the cherries begin to color; and finally, they are dusted with finely-ground sulphur and talc two or three days before picking begins.

Pear blight control has passed its fifth-year test, showing satisfactory success at low expense where the care and management are adequate. The raspberry variety Herbert appears to be immune to raspberry yellows. Accounts are given of operations against insect pests. A list of publications issued is also given.

[Fruit and berry diseases in Ontario], W. H. Hearst (*Rpt. Min. Agr. Ontario, 1917, pp. 42–45*).—A substantially identical report is noted above.

The spike disease of peach trees: An example of unbalanced sap circulation, A. and G. L. C. Howard (*Indian Forester, 45 (1919), No. 12, pp. 611–617, pl. 1*).—The authors deal with a pathological condition of peach trees closely resembling spike of sandalwood and supposedly due to the same general cause, which is asserted by Hole to be prolonged unbalanced sap circulation (E. S. R., 39, p. 255).

The trouble is described as it occurs, generally on peach budded on almond in certain localities. The principal direct cause appears to be interruption at the union of graft and stock. The idea of an ultramicroscopic parasite is rejected.

Spike disease of sandal, R. S. Hole (*Ann. Rpt. Bd. Sci. Advice India, 1917–18, pp. 33, 34*).—A field study of spiked sandal is briefly noted.

One of the most characteristic symptoms of this disease is the accumulation of carbohydrates (usually starch) in the leaves and twigs. The disease appears also to be associated with factors decreasing water supply or translocation of organic food, such as injury by fire or attacks by fungi, killing the twigs and injuring the cortex. It may be the result of prolonged action of such factors, and appropriate experiments have been initiated. It is thought that the transport of organic food in the cortex may be hindered in some such way as that suggested by Brierley (E. S. R., 41, p. 453).

A possible cause of spike in sandal, A. B. Jackson (*Indian Forester, 45 (1919), No. 12, p. 635*).—It is stated that the symptoms of spike are such as might be brought about by a prolonged unbalanced circulation of sap. No fungus or insect has been shown to cause the trouble. Spike usually occurs where the growth of sandal is densest, often at great distances from the nearest spiked area. Sandal is a root parasite and is parasitic on a large number of trees, including those of its own species. The question is raised whether a prolonged unbalanced circulation of sap and consequent spike disease might not be produced by excessive parasitism of sandal on sandal.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Whitetail deer in New York.—A study of the operations of the buck law, W. S. CARPENTER (*Albany: N. Y. Conserv. Comm. [1919], pp. 31, figs. 6*).—The study of the habits of the whitetail deer here reported led to the conclusion that the deer law should be amended to admit of the killing of only one buck and the season should be shortened by cutting out the first two weeks in October.

The gray wolf of South Dakota, B. DALRYMPLE (*Altoona, Pa.: Altoona Tribune Co., 1919, pp. 31, pls. 21*).—This account of the gray wolf deals particularly with its habits as related to means for its destruction. The equipment required in combating the pest is considered.

Spirochæta icterohæmorrhagiæ in the common rat in England, with remarks on the minute structure of these Leptospira, A. C. COLES (*Parasitology, 11 (1918), No. 1, pp. 1–9, pls. 2*).—Previously noted from another source (E. S. R., 39, p. 759).

The bioclimatic law, A. D. HOPKINS (*Jour. Wash. Acad. Sci., 10 (1920), No. 2, pp. 34–40*).

The collection and preservation of insects, E. G. SMYTH (*Rev. Agr. Puerto Rico, 3 (1919), Nos. 2, pp. 17–33, pl. 1, figs. 2; 3, pp. 28–43, figs. 11*).—A brief popular account.

Twelfth report of the State entomologist and plant pathologist, 1918–19, W. J. SCHOENE (*Quart. Bul. Va. State Crop Pest Comm., 1 (1920), No. 4, pp. 28, figs. 4*).—This, the usual report (E. S. R., 40, p. 647), covers the work for the biennial period ended September 30, 1919. Brief accounts are included on the sweet potato weevil (*Cylas formicarius*) and the oriental peach moth (*Laspeyresia molesta*), and reference is made to insect outbreaks during the period and the status of investigational work.

[Leaflets on economic insects in Canada] (*Canada Dept. Agr., Ent. Branch, Crop Protec. Leaflet 11, pp. 2, figs. 5; 12, pp. 3, figs. 4*).—These deal, respectively, with The Date on which It Is Safe to Reseed Fields in the Prairie Provinces after They Have Been Devastated by Cutworms, by E. H. Strickland, and The Beet Webworm (*Loxostege sticticalis*), by E. H. Strickland and N. Criddle.

Second hundred notes on Indian insects, T. B. FLETCHER (*Agr. Research Inst. Pusa Bul. 89 (1919), pp. VII+102, pls. 32*).—These notes, in continuation of the one hundred previously noted (E. S. R., 36, p. 653), deal with insects of India of more or less economic importance.

Preliminary list of insects associated with cotton in Egypt, E. W. ADAIR (*Agr. Jour. Egypt, 8 (1918), pp. 80–88*).—This is an annotated list arranged by orders.

Report to the War Committee of the Royal Society on the work of the Grain Pests (War) Committee, W. A. HERDMAN (*Roy. Soc. [London], War Com. Memo. 3 (1918), pp. 3*).—A brief report of the work of the committee.

Monthly notes on grubs and other cane pests, II, J. F. ILLINGWORTH (*Bur. Sugar Expt. Stas. Queensland, Div. Ent. Bul. 8 (1919), pp. 51, pls. 2*).—This report, in continuation of that previously noted (E. S. R., 41, p. 354), covers the year from July, 1918, to June, 1919.

Insect pests and plant diseases in the vegetable and fruit garden, F. M. Duncan (*London: Constable & Co., Ltd., 1919, pp. 95, pls. 12*).—A popular work.

Insects affecting the avocado in Trinidad and Tobago, F. W. Urich (*Bul. Dept. Agr. Trinidad and Tobago, 18 (1919), No. 3, pp. 129–131, pls. 2*).—The insects mentioned as attacking the avocado include *Solenopsis geminata*, which not only attends mealy bugs and scale insects but also bites off young bark from shoots and stems of the trees; scale insects, including *Pulvinaria pyriformis*, *Aspidiotus destructor*, *Saissetia nigra*, *Pseudococcus nipæ*, and the citrus mealy bug; the webbing caterpillar (*Stericta albifasciata*, which sporadically attacks and devours young leaves and blossoms of tall trees; and several minor pests, namely, *Selenothrips rubrocinctus*, greenhouse thrips, and *Aleurodicus neglectus*.

Grasshopper control in Montana, J. R. Parker (*Bien. Rpt. Mont. Bd. Hort., 10 (1917–18), pp. 80–85, figs. 4*).—The data here presented have been previously noted (E. S. R., 39, p. 763).

The Blattidæ of Panama, M. Hebard (*Mem. Amer. Ent. Soc. No. 4 (1919), pp. 148+VI, pls. 6*).—In the course of his study of 894 specimens from Panama the author has recognized 47 genera and 93 species and races, of which 10 genera and 37 species are described as new.

The native host plant of the camphor thrips (Cryptothrips floridensis), J. R. Watson (*Fla. Buggist, 3 (1919), No. 2, pp. 25–27*).—The author finds that the native bays of the genus Tamala are the hosts of the camphor thrips, a native insect which has spread to the camphor wherever opportunity offered. The uneven distribution of this thrips in Florida and its absence from many camphor hedges and trees is thought to be explained by the remoteness of the uninfested trees from bays and lack of transportation facilities. This thrips seems to have no choice whatever as between camphor and bay, provided the leaves or twigs are of an equal age.

The bionomics of Aphis grossulariæ and A. viburni, M. D. Haviland (*Proc. Cambridge Phil. Soc., 19 (1919), No. 5, pp. 266–269; abs. in Rev. Appl. Ent., Ser. A, 7 (1919), No. 8, pp. 322, 323*).—The author's observations indicate that *A. grossulariæ*, which is a serious pest of currant and gooseberry bushes in Great Britain, is probably identical with *A. viburni*, a common species which is found on guelder rose (*Viburnum opulus*) in spring and summer.

A contribution to our knowledge of South Indian Coccidæ, T. V. Ramakrishna Ayyar (*Agr. Research Inst. Pusa Bul. 87 (1919), pp. 50, pls. 16, figs. 5*).—One hundred and twenty-nine species of Coccidæ occurring in South India are here considered.

Sericulture, J. Vieil (*Sériciculture. Paris: J. B. Baillière & Sons, 1920, rev. and enl. ed., pp. 403, figs. 71*).—This is a small handbook, which is one of the volumes of the Encyclopédie Agricole, published under the direction of G. Wery.

A study of tobacco worms and methods of control, L. B. Edrozo (*Trop. Agr. [Ceylon], 50 (1918), No. 6, pp. 331–336; 51 (1918), No. 1, pp. 53–58*).—The data presented, which relate to Philippine insects, have been noted from another source (E. S. R., 40, p. 62.)

The aquatic adaptations of Pyrausta penitalis (Lepidoptera), P. S. Welch (*Ann. Ent. Soc. Amer., 12 (1919), No. 3, pp. 213–226*).—This is a report of studies made on Sandusky Bay, Ohio, where *Nelumbo lutea*, the plant food of this species, occurs abundantly. While its life cycle is imperfectly known, there appear to be at least two generations per year. The older larvæ possess a well-developed efficient form of surface swimming and can withstand constant submergence for a period of 1.5 hours. Two well-defined periods are recognized in the feeding activities of the larvæ, (1) an early one, the leaf-feeding period, and (2) a later period, the petiole period. After the caterpillar has attained the length of about 14 mm. the surface feeding under webbings is abandoned and it begins to tunnel lengthwise into the upper end of the petiole, boring through from the upper surface.

"After a burrow long enough to contain the whole larvæ is constructed, the caterpillar turns about and feeds mostly on the upper surface of the leaf just outside the entrance. Larvæ are frequently observed on the upper leaf surface with only one or two posterior body segments remaining in the burrow. . . . Since the work of a single larva may lead to leaf deterioration and since it is known that, when present, the buds and seed-capsules are also attacked, it is evident that *P. penitalis* is a serious enemy of Nelumbo. The ability of the older larvæ to migrate from leaf to leaf also increases their menace to the food plant. . . .

"Pupation occurs in the petiole burrow below the water level outside and, since submergence is fatal, protection is provided not only by the walls of the petiole and the formation of a firm, silken cocoon but also by the construction of a special closing device—a cream colored, circular, concavo-convex cap—at the top of the tunnel, excluding the water but providing for the ultimate emergence of the adult."

Worms in walnuts, C. P. Lounsbury (*So. African Fruit Grower and Smallhold., 6 (1919), No. 11, pp. 307, 309*).—This is a discussion of the codling moth as an enemy of walnuts, both in South Africa and in California. It has spread since first recorded as a walnut pest, and is now a formidable walnut pest on farms in the Oudtshoorn district and in the east of the Free State. The loss in the season of 1914–15 in some parts of Oudtshoorn was from 50 to 60 per cent of the crop. Notes on control work in South Africa and correspondence with H. J. Quayle and R. E. Smith relating to its control in California are presented. Reference is also made to a paper by Mackie (E. S. R., 41, p. 665). Papers by Foster (E. S. R., 23, p. 760) and by Smith (E. S. R., 40, p. 456) have been previously noted.

The false codling moth (*Argyroploce leucotreta*), a native insect known as a citrus pest, is said to have been reared from walnut in Pretoria a number of times. A third lepidopteran (*Myelois ceratonia*) has also been reared repeatedly from walnuts, having been collected in Oudtshoorn, Bloemfontein, and Pretoria.

Cotton and the pink bollworm in Egypt, H. A. Ballou (*West Indian Bul., 17 (1919), No. 4, pp. 237–292, pls. 5, figs. 9*).—This is a review of a report on investigations presented to the Egyptian Government which will appear later. It is based upon personal investigations of control measures conducted in Egypt from September, 1916, to February, 1918. The first part (pp. 237–255) treats of the industry's development and falling rate of yield, and the second part (pp. 256–292) of the bionomics of *Pectinophora* (*Gelechia*) *gossypiella*, the extent of its injury, its control, etc. An annotated bibliography of 41 titles is included.

Treatment of cotton in the field as a combative measure against Gelechia attacks, G. C. Dudgeon and W. Cartwright (*Agr. Jour. Egypt, 7 (1917), pp. 120–133*).—The authors conclude from experiments conducted that the reduction of water does not result in a diminution of yield nor damage to the fiber, and that the crop matures earlier and more thoroughly, thereby lessening residues for boll picking—thus reducing the bollworm damage. It is also concluded that topping and stripping the leaves does not result in a diminution of yield, does not damage the fiber, and reduces the bollworm attack. While the best conditions of watering must depend on climate and soil, the tendency of the experiments is to show that the water should be reduced after June to the minimum consistent with the health of the plant and entirely withheld after the first week in August.

Treatment of cotton in the field as a combative measure against Gelechia attacks.—Experiments in 1917, W. CARTWRIGHT (*Agr. Jour. Egypt, 8 (1918), pp. 43–53*).—This paper, which reports upon experiments conducted in continuation of those noted above, relates particularly to the application of water and topping of the plants.

It was demonstrated that the reduction of water and the complete stoppage after the first week in August increases the yield of cotton, does not damage the fiber, and ripens the crop earlier; and that topping in addition on well-developed cotton further increases the yield and does not damage the fiber. The results of treatment in the field on the quality of the fiber are reported upon in an appendix by S. R. P. Carver (pp. 52–58).

The pink bollworm, W. W. EVANS (*Bul. Agr. and Mech. Col. Tex., 3. ser., 4 (1918), No. 21, pp. 34–37*).

The Angoumois grain moth, J. L. KING (*Penn. Dept. Agr., Bur. Plant Indus. Circ. 1 (1920), pp. 14, figs. 3*).—This is a popular summary of information on the Angoumois grain moth, based upon studies by the author previously noted (E. S. R., 38, p. 862).

Occurrence of malaria and anopheline mosquitoes in middle and southern California, W. B. HERMS (*Pub. Health Rpts. [U. S.], 35 (1920), No. 6, pp. 275–281*).—This paper is based upon a State-wide malaria-mosquito survey begun in the spring of 1916, carried on during the summer of 1916 and a portion of the summer of 1917, and completed during the summer of 1919.

Mosquito work of the Bureau of Entomology, D. L. VAN DINE (*Amer. Jour. Pub. Health, 10 (1920), No. 2, pp. 116–119*).

Tarred felt disks for protecting cabbages and related vegetables from attacks of the root fly, A. D. IMMS (*Jour. Bd. Agr. [London], 23 (1917), No. 12, pp. 1222–1224, pl. 1; 25 (1918), No. 1, pp. 59–61*).—These data are based upon the work previously noted (E. S. R., 37, p. 764).

Notes on the lunate onion fly, Eumerus strigatus (Syrphidæ), F. R. COLE (*Ent. News, 31 (1920), No. 2, pp. 31–35, fig. 1*).—The author describes and figures this European species and records observations on its habits. In North America the species was first captured in Ottawa in 1904 and in this country in 1910, but now occurs from Quebec and Maine south to Pennsylvania and in Ottawa, Quebec, Ohio, and Colorado, and along the Pacific coast from California to British Columbia.

The broad-bean weevil, R. E. CAMPBELL (*U. S. Dept. Agr. Bul. 807 (1920), pp. 22, pl. 1, figs. 6*).—Infestation of the broad or horse bean in California by *Bruchus rufimanus* has resulted in a reduction of dry beans for market from 200,000 bags to the present production of about 50,000 bags. It is pointed out that only about 30 or 40 per cent of the crop is used as stock feed, the larger portion being shipped to New York and other eastern cities, where it is used for food by Italians and Portuguese and is known as fava. The principal broad-bean sections in California are around San Francisco Bay and down along the coast to a little below San Luis Obispo. Farmers' Bulletin 969 on this bean, by McKee, has been previously noted (E. S. R., 39, p. 837). This weevil was first recorded as established in the United States in September, 1909, having been found by I. J. Condit at San Luis Obispo.

Life history studies show that there is but one generation of the weevil each year, and that it does not breed in dry beans. The eggs are laid on the green pods in the field from the middle of March to the middle of May. The larvæ reach maturity from August to October, while adults can be found from

August to the following June. The egg stage is from 9 to 18 days; the larval stage, 10 to 15 weeks; the pupal stage, 7 to 16 days; and the adult stage, 1 to 8 months. Germination of infested beans was found to be from 20 to 40 per cent less than that of uninfested beans. Germination of seed a year or more old is only slightly less than that of new seed.

"There are no natural enemies of the broad-bean weevil of any consequence in America. It requires 170 to 180° F. for over half an hour to kill all of the weevils in broad beans. Sulphur is unsatisfactory as a fumigant. Carbon disulphid at the rate of 7 lbs. per 1,000 cu. ft. in a tight box for 24 hours kills all the weevils. In seed held over until the second year all the weevils are dead. Beans from crops planted late, after March 1, are much less infested than those planted earlier, from November to March." The value of late planting as a control measure is emphasized in a paper by the author previously noted (E. S. R., 41, p. 759).

A list of nine references to the literature cited is included.

The fern weevil menace, D. T. Fullaway (*Hawaii. Forester and Agr., 17 (1920), No. 1, pp. 3, 4, pl. 1*).—The Australian fern weevil (*Syagrius fulvitarsis*), a serious infestation of which on Sadleria ferns in the neighborhood of Kilauea as previously noted,[1] is found to have escaped from one or two greenhouses in Hilo and spread all over the city, from Wainaku to Waiakea, on the fish-tail fern. It is said to have been present for 15 years on Sadleria ferns in the mountains back of Honolulu, and it is now impossible to find a single plant that has not suffered severely from its ravages.

Why young queens may fail, F. W. L. Sladen (*Gleanings Bee Cult., 48 (1920), No. 2, pp. 80–82, figs. 2*).—This is a report of experiments in which 16 queens were taken to Duck Island located at the eastern end of Lake Ontario, about seven miles from the nearest colonies, to be mated with drones of selected parentage.

"Only 3 out of the 16 queens were lost, not a large proportion considering the wind blew fresh nearly every day from July 23, the day the bees were brought, until August 4. Of the 13 queens surviving, 12 had started laying. Eleven of these had commenced to lay between July 28 and August 1, at the age of 12 to 16 days, and the remaining one on August 4 when 19 days old. All turned out to be drone-breeders, but 6 of them produced some workers. . . .

"Assuming that laying begins 2 days after mating, which the writer has always found to be true during the active season, none of the drones flying at the time the first queens were mated were less than 5 days old or over 16 days old, and all the drones flying at the time the last queen that began to lay was mated were at least 13 days old, probably many of them were a few days older." The results indicate that in order to function properly the drones should be much older than has previously been thought to be the case.

Contributions to a knowledge of the natural enemies of Phyllophaga, J. J. Davis (*Ill. Dept. Registr. and Ed., Div. Nat. Hist. Survey Bul., 13 (1919), Art. 5, pp. IV+53–138, pls. 13, figs. 48*).—This preliminary paper on the natural enemies of white grubs deals first with the parasites of the larva, which include the black digger wasps of the genus Tiphia, namely, *T. punctata*, *T. transversa*, *T. inornata*, and *T. vulgaris* and their enemies; the banded digger wasps of the genus Elis, including *E. 5-cincta*, *E. atriventris*, *E. interrupta*, *E. obscura*, and *E. illinoisensis;* tachinid and dexiid parasites (*Microphthalma disjuncta*, *M. pruinosa*, *Ptilodexia harpasa*, *P. abdominalis*, *Myocera cremides*, and *Prosena* (*Mochlosoma*) *lacertosa*); two hymenopterous enemies, *Ophion bifoveolatum* and *Pelecinus polyturator;* the tawny bee fly (*Sparnopolius*

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[1] Hawaii. Forester and Agr., 16 (1919), No. 10, p. 259.

fulvus); hairworms of the family Mermithidæ; and a West Indian grub parasite (*Campsomeris dorsata*). The predacious insect enemies of the larva next considered include the robber flies, particularly *Promachus vertebratus*, *P. fitchii*, *Erax maculatus*, and ten other species; *Coenomyia pallida;* two tabanids, the autumn horsefly (*Tabanus sulcifrons*) and the black horsefly (*T. atratus*), etc. Mites as enemies of Phyllophaga larvæ are briefly noted. The parasites of the adult beetle considered include the ortalid flies *Pyrgota undata* and *P. valida*; tachinid flies (*Cryptomeigenia theutis*, *C. aurifacies*, *Eutrixoides jonesii*, *Eutrixa exile*, and *Biomyia lachnosternæ;* and sarcophagids (*Sarcophaga prohibita*, *S. tuberosa sarracenioides*, *S. cimbicis*, *Sarcophaga* n. sp., *S. helicis*, *S. utilis*, *S. falculata*, and *Fannia canicularis*. Mention is also made of spiders as enemies of Phyllophaga. The affections of the larva considered, including nematode, protozoan, bacterial, and fungus diseases, are followed by accounts of the miscellaneous predacious enemies, including birds, wild mammals, and amphibians, and domestic animals.

Of the many parasites of Phyllophaga the Tiphia species are the most efficient and abundant, one or another of the species being found in greater or less abundance in every section of the United States east of the Rocky Mountains. The life histories of the four common species studied by the author at Lafayette, Ind. (*T. punctata*, *T. transversa*, *T. inornata*, and *T. vulgaris*), are similar in many respects. "The black digger wasps, *T. punctata* and *T. transversa*, and probably *T. vulgaris* also, issue from the cocoons during the summer, more often during June and July (*T. inornata* earlier), feed on the flowers of such weeds as asters and parsnips or the honeydew of plant lice (especially that of *Aphis maidis*), mate, and reenter the ground to parasitize the common white grub. The grub is first paralyzed, the wasp stinging it on the underside of the first or second thoracic segment, and an egg is then laid on the dorsum of the thorax, the underside of the abdomen, or elsewhere, according to the species of Tiphia." The egg hatches in four or five days, and the larva immediately pierces the integument and begins to suck the body fluid. About two weeks are required for the development of the larva up to the time the cocoon is commenced. Most species appear to remain in the cocoon over winter as larvæ, pupation taking place and the adults emerging the following spring and summer. In the latitudes of Lafayette all species of Tiphia have normally one annual generation.

The life history of only one species of Elis, *E. 5-cincta*, has been studied. Notes on the bionomics of other of the natural enemies are presented.

A bibliography of six pages is included.

Philippine wasp studies (*Hawaiian Sugar Planters' Sta., Ent. Bul. 14* (*1919*), *pp. 186, figs. 106*).—This bulletin consists of two parts:

I. *Descriptions of Philippine wasps*, S. A. Rohwer (pp. 5–18).—Descriptions are given of 7 species of Sphecidæ, 5 species of Psammocharidæ, and 3 species and 1 variety of Vespidæ new to science.

II. *Descriptions of new species and life history studies*, F. X. Williams (pp. 19–186).—A general account is first given of the bionomics of wasps and their economic status, followed by descriptions of 12 new species and a new genus (Hyloliris), one of which species is from Formosa. In his investigations for the Hawaiian Sugar Planters' Association the author was stationed at Los Baños, about 40 miles by rail south of Manila. During the course of his studies from June, 1916, to September, 1917, 182 species of aculeate wasps, including a few Bethylidæ, were collected in the Philippines, of which 52 are treated biologically in this paper. The species *Scolia manilæ* of the Scoliidæ is considered at some length. An account of the species of Tiphia includes keys for the separation of the males and females of three species, prepared by P. H. Timberlake.

A bibliography of six pages is appended.

The importation of Tiphia parellela from Barbados to Mauritius, D. D'EMMEREZ DE CHARMOY (*Dept. Agr. Mauritius, Sci. Ser. Bul. 6 (1918), [English Ed.], pp. 89–103, pl. 1*).—Previously noted from another source (E. S. R., 38, p. 467).

The digger chalcid parasite (Dirrhinus sarcophagæ n. sp. on Sarcophaga aurifrons), W. W. FROGGATT (*Agr. Gaz. N. S. Wales, 30 (1919), No. 12, pp. 853–855, figs. 4*).—During the course of investigations at the Government Sheep Fly Experiment Station a small chalcid wasp which burrows into the loose soil and deposits eggs in the pupæ of the flesh fly (*S. aurifrons*) was met with, and is here described as new.

The red spiders of America and a few European species likely to be introduced, E. A. MCGREGOR (*Proc. U. S. Natl. Mus., 56 (1919), pp. 641–679, pls. 6, figs. 11*).—Thirty-one species of spider mites are recognized, of which one (*Tetranychus pacificus*) is described as new. The genus Anychus is erected for *T. banksi* and *T. rusti* and Septanychus for *T. tumidus*.

A list of 23 references to the literature is included.

The dust method for controlling rust mite on citrus trees, W. W. YOTHERS (*Fla. Grower, 20 (1919), No. 23, pp. 8, 9, fig. 1*).—This is a paper read before the Florida Citrus Seminar, in which attention is called to the value of sulphur applied as a dust in the control of the rust mite.

Several experiments conducted by the author in 1918 corroborate earlier work, and show that the effect of the sulphur upon the mite is practically instantaneous. "Since the incubation period of the rust mite egg is about five days, the mortality will be complete if the interval between the dust application and the first rain is an equally great length of time."

Experiments on a fairly large scale in two fields are reported upon. Examinations made after application of dust consisting of 20 per cent hydrated lime and 80 per cent sulphur showed practically all mites to have been killed within one hour. The results show flowers of sulphur to be as effective as the finely ground mixture of sulphur and lime. So long as the sulphur was present it killed the young mites as soon as they hatched out. While one dusting was not enough to produce bright fruit, it is thought that two will be. It is concluded that dusting done during the hottest and driest part of the day is in all probability equally as effective as when done while the foliage is wet with dew. It is said to be reasonably certain that a pound of sulphur is sufficient for a tree, and that a team and two men can dust 40 acres in a day. The approximate cost of treating 40 acres is placed at 4.7 cts. per tree.

Memorandum on acarids (mites) occurring in stored grain and flour, H. M. DUVALL (*Roy. Soc. [London], War Com. Memo. 2 (1917), pp. 3*).—It is pointed out that flour suffers more deterioration than wheat when attacked by mites, that the effects of such attack are less readily combated, and that moisture content is, at the temperatures at which wheat is stored in England, the primary factor determining the presence of mites in harmful numbers.

FOODS—HUMAN NUTRITION.

Life and its maintenance (*London: Blackie & Son, Ltd., 1919, pp. VIII+297, pls. 5, figs. 5*).—This volume consists of public lectures on certain war problems delivered at University College, London, during the first half of 1918. These include among others: The Problem of Food, by W. M. Bayliss; War

Bread and its Constituents, by F. G. Hopkins; Accessory Food Factors (Vitamins) in Wartime Diets, by E. M. Hume; Alcoholic and Other Beverages in Wartime, by A. R. Cushny; and Cooperation in Food Supply, by A. G. Tansley.

Fat production and economy during the war, R. Cohn (*Ztschr. Angew. Chem., 32 (1919), No. 50, Aufsatzt., pp. 193–198*).—A discussion of the fat situation in Germany during the war.

The author states that the army ration, particularly in the first two or three years of the war, was much higher than the civilian ration. During the winter of 1917–18 the army ration on the East front included 55 gm. of butter or butter substitute for two days in the month only. This, together with the small amount of fat in the meat ration, gave a daily average of about 10 gm. of fat, which was also the civilian ration in the large cities. The fat ration for the armies on the western front was about 25 gm. per day. In discussing the effect of this low consumption of fat the author points out that it should have been accompanied by a corresponding increase in carbohydrate, but that the calorific value of a day's ration was sometimes as low as 2,300 to 2,600 calories in the army, and from 1,200 to 1,400 calories for the civilian population of the large cities.

Various unusual sources of fat utilized to supplement the diminished supply are discussed briefly, including dish water, sewage sludge, oil-bearing seeds, bones, and oils such as fish oil which can be converted into edible products by hydrogenation. In conclusion the author states that it is doubtful if Germany can at present increase the domestic production of fat so that even an average ration of 25 gm. of fat per day can be assured without importation from other countries.

Digestibility of certain miscellaneous vegetable fats, A. D. Holmes and H. J. Deuel, Jr. (*Jour. Biol. Chem., 41 (1920), No. 2, pp. 227–235*).—This paper from the Office of Home Economics, U. S. Department of Agriculture, reports the results of an investigation of the digestibility of avocado and cupuassú bean fats, and cohune, hempseed, palm-kernel, and poppy-seed oils. The methods followed were essentially the same as those followed in the previous digestion experiments conducted by this Office (E. S. R., 41, p. 170).

The digestibility coefficients obtained were as follows: Avocado fat 87.9 per cent, cohune oil 99.1, capuassú fat 94.1, hempseed oil 98.5, palm-kernel oil 98.0, and poppy-seed oil 96.3 per cent. "The digestibility of the protein and carbohydrate of the entire ration was essentially the same as that in other experiments of a similar nature, indicating that the fats exercised no unusual effect on the utilization of these constituents. These fats and oils, with the possible exception of cupuassú fat, which caused slight disturbances, produced no abnormal physiological effects and may be regarded as satisfactory for food purposes. Cohune, hempseed, palm-kernel, and poppy-seed oils especially are very highly utilized by the human body."

The composition of sausage substitutes, particularly those made from goat meat, H. Lührig (*Pharm. Zentralhalle, 60 (1919), No. 42, pp. 471–473*).—Analyses are reported of different varieties of sausage made from goat meat. The samples examined contained, on the whole, less water and more fat than the corresponding war sausages made from beef and pork.

Fish pudding, fish dumplings, fish sausage, and similar preparations, P. Buttenberg, J. Angerhausen, and L. V. Noel (*Ztschr. Untersuch. Nahr. u. Genussmtl., 38 (1919), No. 5–6, pp. 145–153*).—Descriptions and analyses are given of various canned fish preparations imported into Germany from Norway and Denmark, and of fish and seal sausages.

Honey powder, honey aroma, and similar war concoctions, A. Beythien (*Ztschr. Untersuch. Nahr. u. Genussmtl., 38 (1919), No. 5–6, pp. 159–165*).—

The author describes many varieties of artificial honey manufactured in Germany during the war. He points out that the preparation of such substances is not as simple as might appear, and that consequently it is inadvisable to attempt their preparation in the home.

Studies on the secretion of gastric juice, S. J. Cohen (*Jour. Biol. Chem., 41 (1920), No. 2, pp. 257–261, figs. 7*).—The author reports that in 175 samples of gastric juice from 17 dogs the free hydrochloric acidity varied from 0 to 0.48 per cent, while the total chlorids varied from 0.39 to 0.54 per cent. This is thought to corroborate Pavlov's view that gastric juice is secreted with a constant acidity, and that variations are due to secondary neutralization.

The neutrality of the blood, W. M. Bayliss (*Jour. Physiol., 53 (1919), No. 3-4, pp. 162–180*).—For determining the H-ion concentration of arterial blood the author has devised an indicator method which is said to be capable, with practice, of as accurate results as the electrical method.

Blood to the extent of about 10 cc. is led directly into conical centrifuge tubes supplied with a small amount of powdered potassium oxalate and 3 or 4 cc. of liquid paraffin. After the blood has been collected, more liquid paraffin is added until the tube is nearly full. The tube is shaken to dissolve the oxalate and centrifuged, after which one drop of 0.1 per cent neutral red solution is added to the upper part of the plasma by means of a fine pipette, which is also used to mix the indicator with the plasma. The color is then noted and compared either with that of neutral red in a series of phosphate solutions of known H-ion concentration, if the exact H-ion concentration is to be determined, or with the other samples of blood taken after various treatments of the animal.

In the present series of experiments, the H-ion concentration of cat's blood was determined before and after the intravenous injection of sufficient acid to reduce the bicarbonate to one-third its normal value, and similarly after the injection of sufficient sodium bicarbonate to increase its concentration by one-fourth. The results obtained are summarized and discussed as follows: "Intravenous injection of acid in sufficient quantity to neutralize half the bicarbonate in the blood does not increase the H-ion concentration of the plasma. The chief mode of compensation is by increase in pulmonary ventilation and consequent decrease of the carbon dioxid in the blood. Renal excretion of acid, and ammonia production in the liver do not appreciably come into play in short experiments. Injection of alkali is not so readily neutralized. The chief agent in this case appears to be excretion of alkaline urine.

"The proteins of the plasma play no perceptible part in the maintenance of neutrality between the limits of H-ion concentration possible in the living organism, namely, below 10^{-4} or above 10^{-10} normal. No evidence was obtained that either sodium bicarbonate, serum proteins, or both together convey carbon dioxid from the tissues to the lungs. Thus the only function of the sodium bicarbonate in the blood is to regulate the H-ion concentration, while, under normal conditions, the only function of the proteins is to give a colloidal osmotic pressure and a moderate degree of viscosity to the plasma."

Note on the hydrogen-ion concentration of the human duodenum, F. J. Myers and J. F. McClendon (*Jour. Biol. Chem., 41 (1920), No. 2, pp. 187–190, fig. 1*).—Determinations are reported of the H-ion concentration of the duodenum of a human subject three or four hours after ordinary rather varied meals. The pH values varied from 3.2 to 7.82, but showed a tendency to fluctuate around the neutral point, pH 6.3. The fact that the extreme range on the acid side was greater than on the alkaline side was considered to be due possibly to the spurting of gastric contents into the duodenum.

Changes in the hydrogen-ion concentration of the urine, as result of work and heat, G. A. Talbert (*Amer. Jour. Physiol., 50 (1920), No. 4, pp. 579–588, figs. 2*).—This paper reports the results of determinations of the H-ion concentration of the urine of the subjects in the investigation previously noted (E. S. R., 42, p. 465) after intense exercise and after subjection to heat.

The average results of 37 observations of the pH values of the urine immediately before and immediately after intense muscular exercise of from 15 to 20 minutes' duration were pH 6.57 and 6.11, respectively. The results of 31 observations of the pH value of the urine before and after exposure to the heat of a sweat-cabinet for 15 or 20 minutes were pH 6.28 and 6.12, respectively.

These results indicate that both exercise and heat have a tendency to cause increased acidity of the urine. In commenting upon the possible causes of this increase in acidity the author reviews briefly the results and conclusions of other investigators, indicating that the exact changes brought about in the urine constitute a question that only further research can settle.

The metabolism of white races living in the Tropics.—II, The composition of the urine, W. J. Young (*Ann. Trop. Med. and Parasitol., 13 (1919), No. 3, pp. 215–231*).—In the present study, which is in continuation of the investigation previously noted (E. S. R., 33, p. 366), the main object has been to compare the concentration of the urine of white subjects in Australia with that of European subjects.

The average composition of 24-hour samples of urine from 25 subjects of various occupations and on their ordinary diet was as follows: Volume 782 cc., specific gravity 1.0254, total nitrogen 10.4 gm., total sodium 7 gm., chlorids per 100 cc. 1.13 gm., and P_2O_5 1.73 gm. Compared with the accepted European standards these results show a much smaller volume, higher specific gravity, and lower content in sodium chlorid, which may be explained from excessive perspiration tending to increase the concentration of the urine but at the same time to remove the salt along with the water. The total nitrogen was considerably lower than that reported in European analyses, a result which, it is thought, can not be accounted for by loss of nitrogen from the skin but indicates rather a low nitrogen metabolism.

To test the theory that the higher concentration of the urine in the Tropics causes a greater amount of kidney disease than is found in temperate climates, an examination for albumin was made of the urine of persons not showing any other symptoms of kidney disease. An examination of the urine of 633 patients, including 330 men and 303 women, gave positive reactions in 57 cases, 42 of them men, thus indicating a comparatively high percentage of albuminuria and that it was more marked in men than in women.

Phosphorus requirement of maintenance in man, H. C. Sherman (*Jour. Biol. Chem., 41 (1920), No. 2, pp. 173–179*).—In this contribution, in which the author has had the cooperation of A. R. Rose, M. Koch, F. Mathews, and E. Osterberg, the question of phosphorus requirement for maintenance in man has been treated in a similar manner to that of the protein requirement previously noted (E. S. R., 42, p. 459). The indicated phosphorus requirements for maintenance per 70 kg. of body weight per day have been calculated from all available published experiments which have been considered quantitatively comparable, and from six series of experiments the data for which are reported in this paper for the first time.

The 95 experiments reported include 34 upon men and 61 upon women. The phosphorus requirement ranged from a minimum of 0.52 to a maximum of 1.2 gm., with an average of 0.88 gm. per 70 kg. of body weight per day. The experiments upon men averaged 0.87 gm., and those upon women 0.89 gm. per 70 kg. per day. The range of variation was quite similar to that in the compilation of experimental data upon the protein requirement. Suggested reasons for variations in the phosphorus output are the function of phosphates in the maintenance of neutrality in the body, and possible differences in the quantitative efficiency in nutrition of different forms of phosphorus.

The author concludes that "while several of the factors determining the phosphorus output remain for further quantitative investigation, we are probably justified in concluding that we now know the phosphorus requirement with about the same probable accuracy that the protein requirement is known, and that about one-fortieth to one-fiftieth as much phosphorus (reckoned as element) as of protein is required in the maintenance metabolism of man."

In comparing this maintenance requirement with the amount furnished in the food supplies of 224 families or groups of people selected as typical of the population of different parts of the United States, only 8 dietaries showed less than 0.88 gm. of phosphorus per man per day, and of these only 2 would have been below the average requirement if the food had been sufficient in amount to cover the energy requirement amply. It is pointed out that these two cases were both reported from the Southern States, a fact thought to confirm the opinion of McCollum et al. (E. S. R., 41, p. 469) that the pellagra-producing diets of the South are low in their phosphorus content. With this exception the author is of the opinion that "the danger that a freely chosen American dietary will be deficient in either protein or phosphorus does not appear serious, in the light of our present evidence, so far as the requirements of maintenance are concerned. What quantities of phosphorus in the food will best meet the requirements of growth, pregnancy, and lactation remains to be determined."

The feeding of normal infants during the second year, J. L. MORSE (*Jour. Amer. Med. Assoc., 74 (1920), No. 9, pp. 577–580*).—This is a general discussion of the selection of food for infants from one to two years of age. The author advocates a simple diet consisting of milk, selected cereals, broth, beef juice, fruit juices, and small amounts of toast, stale bread, or crackers. The use of meat and green vegetables during this period is discouraged.

Calcium metabolism of infants and young children, and the relation of calcium to fat excretion in the stools, L. E. HOLT, A. M. COURTNEY, and H. L. FALES (*Amer. Jour. Diseases Children, 19 (1920), No. 2, pp. 97–113*).—From calcium determinations on the stools collected in the study of fat metabolism previously noted (E. S. R., 42, p. 60), certain problems regarding calcium metabolism, especially in its relation to fat metabolism, have been studied. In this paper are presented the findings for infants taking modifications of cow's milk. The results of these observations are summarized as follows:

The average absorption of calcium oxid by healthy infants taking modifications of cow's milk was 0.09 gm. per kilogram of body weight as compared with 0.06 gm. for breast-fed infants. The daily total excretion of calcium oxid in the stools varied from 0.34 to 1.06 gm., averaging 0.7 gm. The excretion and absorption of calcium were in general dependent on the calcium intake, the absorption being from 35 to 55 per cent of the intake. This would indicate that to insure an absorption equal to the average found for breast-fed infants the intake of calcium oxid should be at least 0.13 gm. per kilogram, and to insure the average absorption of 0.09 gm. the intake of calcium oxid should be at least 0.19 gm. per kilogram. The best absorption of calcium was obtained when the food contained from 0.045 to 0.06 gm. of calcium oxid for every gram of fat and when the fat intake was not less than 4 gm. per kilogram.

An excessive calcium intake did not increase the calcium absorption, and a very low intake decreased the absorption. The total absorption of calcium varied with the weight of the child, while the per kilogram absorption did not vary regularly with either the age or the weight.

The relation of calcium excretion to soap excretion was not constant. The calcium that could be lost as soap was never a large proportion of the calcium intake. The calcium percentage of the total solids varied as a rule with the water content, diminishing as the water increased.

The calcium absorption was much lower in infants with diarrhea and with rickets than in healthy infants. The administration of cod-liver oil regularly increased the absorption of calcium unless diarrhea was present.

Fat-soluble vitamin.—IV, The fat-soluble vitamin content of green plant tissues together with some observations on their water-soluble vitamin content, H. Steenbock and E. G. Gross (*Jour. Biol. Chem., 41 (1920), No. 2, pp. 149–162, figs. 17*).—In continuation of the studies on fat-soluble vitamin previously noted (E. S. R., 42, p. 460) the authors, with the cooperation of M. T. Sell, present data on the fat-soluble vitamin content of certain leafy vegetables. In the experiments reported the material was air-dried at room temperature, ground to a meal, and incorporated in varying amounts in basal rations deficient in fat-soluble vitamin and in some cases in water-soluble vitamin. In some instances water-soluble vitamin was included in the form of ether-extracted wheat embryo.

The data, presented in the form of charts, indicate that 5 per cent of clover or alfalfa as the sole source of fat-soluble vitamin in a ration otherwise satisfactory allows normal growth and rearing of some young. The same amount of lettuce, spinach, and chard was found to furnish enough fat-soluble vitamin for long continued though somewhat subnormal growth. Few young were produced and none reared, but in no case was there evidence of xerophthalmia. Of the three, spinach appeared to be the richest and lettuce the poorest in fat-soluble vitamin. With cabbage poor results were obtained even when fed at a 15 per cent level. These results are thought to be in harmony with the theory proposed in the preceding paper of a correlation between fat-soluble vitamin distribution and the occurrence of certain yellow plant pigments.

The data also showed that, while 10 per cent of alfalfa and of clover was inefficient in respect to water-soluble vitamin, 15 per cent of either furnished enough of that vitamin for normal growth. Cabbage also furnished enough water-soluble vitamin when fed at a 15 per cent level.

Fat-soluble vitamin.—V, Thermostability of the fat-soluble vitamin in plant materials, H. Steenbock and P. W. Boutwell (*Jour. Biol. Chem., 41 (1920), No. 2, pp. 163–171, figs. 3*).—Continuing the investigation noted above the authors, with the cooperation of M. T. Sell and E. G. Gross, have determined the stability of the fat-soluble vitamin in plant materials by means of feeding experiments in which the air-dried material furnishing the fat-soluble vitamin was soaked in water, autoclaved for three hours at approximately 15 lbs. pressure, and again air-dried before being incorporated into the ration.

The data obtained indicate that this treatment did not cause noticeable destruction of the fat-soluble vitamin of yellow maize, chard, carrots, and sweet potatoes. Hubbard squash was found to contain a considerable amount of fat-soluble vitamin which was not destroyed by the autoclaving process. The data on alfalfa are considered to be inconclusive, although all of the four rats fed on the ration containing autoclaved alfalfa declined after three or four weeks and died, two showing signs of xerophthalmia.

The general conclusion drawn is that "the fat-soluble vitamin as found in the plant kingdom in a grain, in leaf and stem tissue, in fleshy roots, and in a cucurbitous vegetable is comparatively stable at a high temperature."

Action of substances influencing the carbohydrate metabolism in experimental beriberi, C. Funk (*Jour. Physiol., 53 (1919), No. 3–4, pp. 247–256*).—The author summarizes and discusses previous investigations dealing with the physiology of the antiberiberi vitamin, and reports a continuation of his own studies of the rôle of this vitamin in carbohydrate metabolism (E. S. R., 32, p. 257). In the first series of experiments described, a number of substances known to affect carbohydrate metabolism were injected into normal pigeons and into pigeons fed on polished rice, and the effect on the sugar and the amino nitrogen of the blood and on the glycogen of the liver noted. The substances tested were glucose, phlorizin, adrenalin, pituitrin, and thyroid and parathyroid glands. In the second series the same substances, with the exception of glucose, were fed to pigeons on a polished rice diet, and their effect on the time of beriberi onset, loss in weight, and death observed.

In the first study glucose, which was given per os, caused a disappearance of glycogen from the liver and a diminution of blood sugar in both the pigeons fed a normal diet and those fed on polished rice, and a diminution of amino nitrogen on the polished rice diet only. Phlorizin increased slightly the glycogen and the blood sugar in the controls, and decreased the glycogen and slightly increased the sugar in the rice series. Adrenalin and pituitrin had no marked effect on carbohydrate metabolism. Desiccated thyroid gland produced a considerable sugar increase in the rice series and a disappearance of glycogen and increase of amino nitrogen in both series. Parathyroids produced in both series an increase of glycogen and blood sugar, and a decrease of amino nitrogen

In the feeding experiments phlorizin appeared to hasten the onset of the disease and to increase the loss in weight, adrenalin to hasten death, pituitrin to have no effect, the thyroid gland to hasten death with great loss in weight but with evidence of beriberi in only one case out of six, and the parathyroid gland to hasten the development of beriberi symptoms but not to shorten the period before death.

The author is of the opinion that, with the exception of pituitrin, the action of the substances studied "has produced interesting results which might become more clearly defined on further investigation."

The experimental production of edema as related to protein deficiency, E. A. Kohman (*Amer. Jour. Physiol., 51 (1920), No. 1, pp. 185–187*).—This is a brief report of a study of the etiology of the edema noted by Denton and Kohman (E. S. R., 40, p. 267) as occurring in a large percentage of rats fed on a low-protein carrot diet. Rats were fed diets deficient, respectively, in protein, calories, and fat, and in fat-soluble A and water-soluble B except as furnished by the carrots. Some of the diets were also of high and low water content, of an increased acid content, and of high and low salt content.

It was found that, while excessive water intake and an increase in the acid content of the diet both tended to increase edema, the primary cause of the edema was lack of protein. Edema was produced and cured three times in one rat by alternating a low protein diet with an adequate protein diet.

"These findings warrant the general conclusion that, if it is necessary to limit the amount of protein in a diseased condition or in a period of national economic stress (as was necessary in some of the European countries during the recent war), it is advisable to administer the low-protein diet in a form free from excess of water and any acid-producing foods. Symptoms of developing edema must be looked for and adequate protein supplied immediately to effect a cure."

Protein diets and undernutrition in treatment of diabetes, F. M. ALLEN (*Jour. Amer. Med. Assoc., 74 (1920), No. 9, pp. 571–577*).—This is a brief discussion, illustrated by case reports, of the author's practice in the arrangement of the diet for diabetic patients following the period of fasting. Five facts which may serve in the planning of such diets are given as follows:

"(1) The total calories at first should be very low and increased gradually; (2) protein is the most important food; (3) the tolerance for protein is highest when other foods are excluded or closely restricted; (4) the caloric requirement falls with the body weight and may reach a very low minimum; and (5) the tolerance rises as the weight falls, and with exceedingly few exceptions the two curves intersect at some level on which life can be supported."

Boiled vegetables for the use of diabetics, P. J. CAMMIDGE (*Lancet [London], 1919, II, No. 26, pp. 1192, 1193*).—For the purpose of determining which are the best vegetables to use in the preparation of the thrice-boiled vegetables for use in diabetes, an examination was made of the content in total carbohydrates and reducing sugars of 16 varieties of commonly used vegetables after three successive treatments with boiling water for 15 minutes.

The data reported indicate that the number of boilings required to secure a carbohydrate-free residue varies considerably with different vegetables, and is not directly related to the amount of carbohydrates originally present. Comparatively few of the vegetables investigated were entirely freed by three boilings. Celery, rhubarb, and spinach were freed from carbohydrate after the second boiling, and sliced turnip and sliced carrot after the third boiling, while all the other vegetables retained more or less carbohydrate even after three boilings. These were, in the order of increasing amounts of total carbohydrate retained, Spanish onion, beet root, cauliflower stalk, cabbage, [Brussels] sprouts, parsnips, sea kale, cauliflower flower, artichoke, potato, and swedes.

Reference is also made to the experiments of Wardall (E. S. R., 39, p. 571) on the extraction of vegetables at a low temperature (60° C.) as offering possibilities of an extension of the limited range of vegetables open to severe cases of diabetes.

Botulism, W. L. DODD (*Amer. Food Jour., 15 (1920), No. 2, pp. 12–14*).—A nontechnical discussion of the history, source, and means of prevention of botulinus poisoning.

An outbreak of botulism, D. L. SISCO (*Jour. Amer. Med. Assoc., 74 (1920), No. 8, pp. 516–521*).—A report is given of an outbreak of botulism occurring in New York City in January, 1920, and resulting in the deaths of 6 out of the 7 members of the family.

The outbreak, like the ones previously noted by Jennings et al. (E. S. R., 42, p. 262) and by Armstrong et al. (E. S. R., 42, p. 261), was traced to factory-canned ripe olives, and resembled these outbreaks in every way. Antitoxin (Graham) obtained from the University of Illinois was administered to one patient 48 hours after the onset of symptoms with no beneficial results. The serum administered was later proved to be from a nonhomologous strain, which would probably have rendered it ineffective even if applied earlier. Serum from another strain of *Bacillus botulinus*, probably homologous with that of the olives, was obtained from the Bureau of Animal Industry, U. S. Department of Agriculture, and administered to a child of the family who had eaten one olive but had not developed definite and clear-cut symptoms. "Such symptoms never did develop, but to what degree the antitoxin was responsible for their failure to develop will probably never be known."

ANIMAL PRODUCTION.

An Introduction to Biology and other papers, A. D. Darbishire (*New York: Funk & Wagnalls Co., 1917, pp. XVIII+291, pl. 1, figs. 18*).—The title essay is a study of the philosophical basis of biological thought, which the author did not live to complete. The rest of the volume consists of reprints of published papers, including The Supposed Antagonism of Mendelian to Biometric Theories of Heredity (1905), The Difference between Physiological and Statistical Laws of Heredity (1906), and Some Tables for Illustrating Statistical Correlation (1907). A list of the author's publications is appended.

The morphology of the mammalian seminiferous tubule, G. M. Curtis (*Amer. Jour. Anat., 24 (1918), No. 3, pp. 339–394, figs. 24*).—The form of the seminiferous tubule in the testes of the mouse, rabbit, and dog was studied by means of wax reconstructions and by the histological examination of isolated specimens.

The process of spermatogenesis was found to occur along the tubule in a wave-like manner. The waves varied in length, uniformity, and direction of course and in some cases reversed their course. A region was discovered in the mouse tubule where embryonic structure was retained. It is suggested that this may be a reserve for growth or regeneration.

The relation of the embryo to the principal axis of symmetry in the bird's egg, G. W. Bartelmez (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 35 (1918), No. 6, pp. 319–361, figs. 4*).—The author extends his previous study of pigeon eggs (E. S. R., 28, p. 668) and summarizes some of the neglected work of the pioneer embryologists who without modern appliances described the structure of the bird's egg "in a manner that must arouse the wonder and admiration of any embryologist to-day."

Two main axes are recognized, the principal (end to end) egg axis and the axis of the early embryo. These usually form an angle of from 45 to 90°, but there is considerable variation, more in the hen's egg than in the pigeon's. "Extreme variations of the axis angle are probably due to imperfect orientation of the ovum in the oviduct, to abnormalities in its action, or to irregularities during the final growth period of the oöcyte." Narrower variations are attributed to chance.

The yolk is not a sphere and has one axis longer than the others. "The long axis can be indentified in all ovarian oöcytes, and at the time of ovulation the ovum is oriented in the oviduct with reference to its long axis. The long axis accordingly determines the principal axis as we see it in the laid egg. . . . The right side of the embryo is nearer that end of the principal egg axis which is predetermined in the ovary to pass first down the oviduct."

Summarizing all available evidence the author concludes that it is invariably the pointed end of the egg which in the oviduct is directed toward the cloaca. In many cases the blunt edge emerges first when the egg is laid, but this is due to chance turnings during the complicated process by which the egg is delivered to the exterior through the prolapsed uterus without touching the walls of either vagina or cloaca.

On the weight of the epididymis, pancreas, stomach, and of the submaxillary glands of the albino rat (Mus norvegicus albinus) according to body weight, S. Hatai (*Amer. Jour. Anat., 24 (1918), No. 1, pp. 71–89, figs. 4*).—The growth in weight of the epididymis, pancreas, stomach, and submaxillary glands was determined on the basis of post mortem data from 259 rats. The weight of each organ is expressed mathematically as a function of body weight.

The physical basis of heredity, T. H. MORGAN (*Philadelphia and London: J. B. Lippincott Co., 1919, pp. 305, pls. 10, figs. 107*).—This is a summary of experimental and cytological evidence in favor of the view that the chromosomes are the bearers of hereditary factors. Six concepts are considered to be sufficiently well established to be designated laws of heredity, viz, segregation, linkage of genes, independent assortment outside of linkage groups, lineal arrangement of genes, interference with crossing over, and the limitation of the number of linkage groups to the number of pairs of chromosomes. There is a bibliography of over 500 titles.

Ensilage, A. W. OLDERSHAW (*Jour. Bath and West and South. Counties Soc., 5. ser., 13 (1918–19), pp. 54–86, pls. 2*).—This is an account of methods of making and utilizing different kinds of silage, particularly in the British Isles, with a bibliography. Chemical analyses made by G. S. Robertson are reported of samples of the following types of silage (from cylindrical silos unless otherwise designated): (1) Oats and vetches, (2) mustard, vetches, and chopped oat straw, ensiled in a gravel pit, (3) vetches, oats, rye, and wheat, (4) corn, (5) corn ensiled in a cart shed, (6) alfalfa, (7) alfalfa from a trench silo, (8) clover and rye grass, (9) meadow hay, and (10) crimson clover from a trench silo.

The composition of "sharps" and bran, and the effect thereon of the food controller's orders, H. E. COX (*Analyst, 43 (1918), No. 503, pp. 53–58*).—It is stated that the British Food Controller's orders requiring a higher extraction of flour during the war has resulted in reducing the starch content of middlings (sharps) and the inclusion in the middlings of the finer particles of bran. The author reports the results of physical and chemical examinations of samples of middlings and bran with particular reference to the relative proportion of starches and pentosans. This proportion is considered a good index of changes in composition.

[Feeding stuffs inspection 1917–18], W. H. STROWD (*Wis. Dept. Agr. Bul. 20 (1918), pp. 103–118 figs. 3*).—These pages contain a report on the inspection of feeding stuffs in Wisconsin from July 1, 1917, to October 31, 1918, the control service having been transferred from the station to the State Department of Agriculture on the former date. Included are tables giving average, maximum, and minimum percentages of protein, fat, and crude fiber found in samples of cotton meal, linseed meal, corn gluten feed, hominy feed, corn feed meal, wheat bran, wheat middlings, red dog, barley feed, brewers' dried grains, alfalfa meal, malt sprouts, vinegar grains, meat scrap, and various mixed and proprietary feeds.

Feed inspection for 1919, W. H. STROWD (*Wis. Dept. Agr. Bul. 25 (1919), pp. 54*).—The protein, fat, and fiber content, and in most cases the prices, of samples of feeding stuffs collected during the year ended October 31, 1919, are reported. These include corn bran, corn oil meal, distillers' grains, wheat shorts, rye feed, buckwheat shorts, and bone meal, as well as additional samples of the materials listed in the preceding note except malt sprouts and vinegar grains.

The breeding industry in North Africa, H. GEOFFROY SAINT-HILAIRE (*L'Elevage dans l'Afrique du Nord. Paris: Augustin Challamel, 1919, pp. XI+530, pls. 33*).—This is an elaborate treatise on the live stock and live-stock industries of Morocco, Algeria, and Tunis, based, it is stated, upon more than 20 years' study. Horses, asses, mules, cattle, sheep, goats, swine, camels, ostriches, and poultry are considered. Much bibilographical material is included.

Suggestions for the winter feeding of steers, E. S. GOOD (*Ky. Agr. Col. Ext. Circ. 75 (1919), pp. 16, figs. 2*).—Directions are given for fattening steers during the winter, particularly when corn silage or sorghum silage is to form an important part of the ration. "The methods outlined have been found efficient and economical from experiments conducted at the Kentucky Experiment Station."

Note on cattle in the Bombay Presidency, G. F. KEATINGE (*Dept. Agr. Bombay Bul. 85 (1917), pp. 39, pls. 3*).—The author provides statistics as to the numbers of cattle in the Bombay Presidency in the years from 1886 to 1916, lists the native breeds of cattle and buffalo, and describes the breeding grounds and conditions of the range. Three maps show the distribution of grazing areas.

On abnormal sexual characters in twin goats, E. RICKARDS and F. W. JONES (*Jour. Anat. [London], 52 (1918), No. 3, pp. 265–275, figs. 8*).—The authors describe the anatomy (gross and microscopic) of the genital organs of a pair of twin goats. At birth they were considered females, but within a few days they began to develop male characters. The genital tubercle elongated so that the "vulva" became a narrow orifice on the under surface of the penis-like clitoris. The nipples and mammary glands continued like those of normal females of the same age. Both were killed when young, but not before it was noted that they behaved like males when in the presence of female goats.

The gonads were typical testes, "absolutely normal in character," each with a typical epididymis. The seminiferous tubules were solid, but this is attributed to the young age of the goats. A vas deferens extended from each testis, but there was also a pair of Müllerian ducts which united distally and formed a typical uterus. The uterus, vasa deferentia, and urethra opened into a common urogenital sinus. The whole internal anatomy resembled greatly that of the anomalous triplet goat described by A. Keith and reported by Davies (E. S. R., 28, p. 770).

The authors believe that the two kids were identical twins, but it is pointed out that even if this view were false Lillie's hormone theory (E. S. R., 40, p. 466) can not be invoked to explain the condition since the two individuals were obviously alike as to sex.

Goat keeping on money making lines, W. POWELL-OWEN (*London: George Newnes, Ltd., 1918, pp. 160, figs. 8*).—The author considers the breeding and housing of goats. He devotes a chapter to the goat as a draft animal, and another to the utilization of goat's milk, goat's meat, and goatskins.

The pig, S. SPENCER (*London: C. Arthur Pearson, Ltd., 1919, pp. 184, pls. 15*).—A treatise on the breeding, rearing, and marketing of swine in England. Particular attention is devoted to the description of breeds.

British pigs, J. LONG (*London: Chapman and Hall, Ltd., 1918, pp. VII+133, pls. 10*).—A manual particularly designed for "the small pig keeper."

Success with hogs, C. DAWSON (*Chicago: Forbes & Co., 1919, pp. 268, figs. 18*).—A book on swine husbandry devoting considerable attention to breeds and types and to feeding methods.

Third annual report Oklahoma State Live Stock Registry Board for the year 1918 (*Oklahoma Sta. Circ. 45 (1919), pp. 120, figs. 10*).—This report contains lists of stallions and jacks licensed in 1918 and considerable miscellaneous material of the same kind as in the previous report (E. S. R., 40, p. 76). The following popular articles are included: Hereditary Unsoundness in Horses, by C. W. McCampbell; The Future of the Draft Horse, by W. Dinsmore; Navel Infection in Young Colts, by L. L. Lewis; The Type of Horse Needed in Oklahoma, by F. A. Heberling; State Aid to Draft Horse Breeding, by E. McFarland; and The Beginner in Raising Draft Horses, by W. L. Blizzard.

The stud stock interests of Great Britain, W. W. Chapman (*Jour. Roy. Agr. Soc. England, 79 (1918), pp. 192–200*).—The author outlines the organization of the British stud stock interests, lists the breed societies, and summarizes statistics of the export of live stock from Great Britain from 1894 to 1918.

Preferential mating of fowls, A. G. Philips (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 5 (1919), No. 4, pp. 28, 30–32, figs. 6*).—The author presents records of the mating activity of individual hens and cocks secured at the Indiana Experiment Station. The plan was to keep a cock and a flock of hens under observation from 7 a. m. to 6 p. m. on two successive days.

In a pen of 10 White Leghorns, the cock in the two days mated 50 times, neglected none of the hens either day and mated with 1 of the hens 9 times. In a flock of 28 White Leghorns the cock mated 77 times (daily average of 1.37 times per hen), but failed to mate with 5 hens either day. During the two following days with half the flock, the same male mated 53 times (daily average of 1.9 times per hen) and served all hens at least once, including the 5 previously neglected. One hen was mated 15 times in the four days.

In a flock of 14 Rhode Island Red hens, the cock mated only 17 times in the two days and missed 5 hens each day. A Black Langshan cock with 8 hens mated 17 times, missing one hen each day. A White Plymouth cockerel with 15 hens mated 28 times and neglected 3 particular hens both days.

Most of the copulations took place toward the end of the day. "The tendency seemed to be for the hens to be mated several times per day or not at all. The observation records show that the males showed attentions to the missed hens but were repulsed."

It is concluded that Leghorn cocks are more active than males of the heavier breeds and that it would be economical to increase the number of hens served by one cock, since the recorded matings are much more numerous than are necessary for continuous fertility.

The development of the chick, F. R. Lillie (*New York: Henry Holt & Co., 1919, 2. ed. rev., pp. XI+472, pls. 8, figs. 250*).—This treatise on the embryology of the chick was first issued in 1908 (E. S. R., 22, p. 272). The first part includes a treatment of the origin of the germ cells and the physiology of egg production, besides tracing the early course of development, while the later chapters assemble much material not readily available elsewhere as to the growth and form of the internal organs and skeleton toward the end of incubation. There is a bibliography of 21 pages.

Care of baby chicks (*U. S. Dept. Agr., Dept. Circ. 14 [1919], pp. 7, figs. 2*).—Designed for the use of boys' and girls' poultry clubs.

Acorns as food for poultry, H. T. Cranfield (*Jour. Bd. Agr. [London], 25 (1918), No. 5, pp. 573–576*).—An experiment is reported in which 17 hens were fed coarsely ground dried acorns in place of scratch feed for four weeks. The number of eggs produced per laying bird was not decreased below the records of the two previous weeks. The proximate composition of the acorn kernels is reported.

Cost of starting a commercial poultry business, Mr. and Mrs. G. R. Shoup (*Washington Sta., West. Wash. Sta. Mo. Bul., 7 (1920), No. 10, pp. 163–165*).—An estimate is given of the first year's expenses and receipts in connection with a flock of 400 pullets.

Runner ducks, E. A. Taylor (*New York: Charles Scribner's Sons, 1918, pp. 62, pls. 10, figs. 5*).—Directions are given for the breeding, management, and feeding of runner ducks, particularly as egg producers. The author states that he trap-nests his ducks.

Duck keeping on money making lines, W. Powell-Owen (*London: George Newnes, Ltd., 1918, pp. 220, figs. 19*).—This volume deals with the breeding and management of ducks and the rearing of ducklings for the table. There are brief sections on geese, turkeys, and guinea-fowl.

DAIRY FARMING—DAIRYING.

The seasonal cost of milk production, F. A. Pearson (*Illinois Sta. Bul. 224 (1919) pp. 3–18, fig. 1*).—The author reports the month to month variation in the cost of producing whole milk for the Chicago market on 18 of the farms included in his study of the year cost presented in Bulletin 216 (E. S. R., 40, p. 878). On these farms during the period covered (fiscal years 1914–15 and 1915–16) were 407 cows, 19 bulls, and 234 young stock, and there were produced for sale 6,717 lbs, of milk per cow.

The data are treated according to two accounting systems, one based on the entire herd, the other on the milk-producing part (cows and the necessary bulls). By the latter system a cow is credited with the value of her calf when it is born, and the cost of replacing milking stock is covered by a debit item, live stock depreciation.

In the computations interest on stock was distributed uniformly throughout the year, but the other expenses and credits for which monthly estimates could not be secured were prorated according to the volume of milk produced. The tables give (1) itemized financial statements by months of expenses and returns not milk, and (2) the amounts of feed and man labor expended monthly per 100 lbs. of milk and the ratio of the cost of these two items to the net cost of production. The following tabulation summarizes the second series of data, the year being divided into two equal periods that roughly coincide with the winter season and the pasture season, respectively. During the winter season 57 per cent of the milk was produced.

Seasonal variation in labor and feed expended (and their combined cost as percentage of the net cost of production) per 100 lbs. of milk.

Period of year.	Herd basis.						Cow (and bull) basis.					
	Man labor.	Grain.	Hay.	Other forage.	Silage.	Portion of net cost.	Man labor.	Grain.	Hay.	Other forage.	Silage.	Portion of net cost.
	Hours.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*P. ct.*	*Hours.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*P. ct.*
November to April..	2.78	53.9	67.8	60.5	233	106.0	2.41	43.9	53.0	42.1	183	86.3
May to October.....	2.38	22.8	18.8	6.1	149	81.1	2.15	17.6	14.2	4.3	115	61.9
Entire year.........	2.60	40.7	46.6	37.4	197	97.9	2.29	32.4	36.4	25.9	154	77.8

The method of using these figures to derive an estimate of costs under any particular schedule of prices is explained, and the value of pasture in reducing costs is discussed in some detail.

Establishment and management of the dairy farm, G. K. Kelkar (*Dept. Agr. Bombay Bul. 86 (1917), pp. 59, pl. 1*).—This is a much augmented edition of Bulletin 31 (E. S. R., 20, p. 476), and includes chapters on housing, managing, and feeding the dairy herd under Indian conditions, the making and disposal of dairy products including ghee (clarified butter), khawa (desiccated milk), and kharwas (a colostrum product), and the business aspects of dairying. Appendixes give sample record forms, dimensions of dairy buildings, an outline of soiling systems, names and analyses of feeding stuffs, equipment tables, etc.

British Friesian cattle, G. Hobson (*Trans. Highland and Agr. Soc. Scot., 5. ser., 30 (1918), pp. 35–55, figs. 4*).—This is an account of early importations of Holstein-Friesian cattle into Great Britain, with notes on milk yields of British Holsteins.

The milk goat dairy, G. H. Wickersham (*Wichita, Kans.: [Author, 1919], 3. ed., pp. 48, figs. 21*).—An enlarged edition of a pamphlet previously noted (E. S. R., 21, p. 573).

Milk, P. G. Heineman (*Philadelphia and London: W. B. Saunders Co., 1919, pp. 684, figs. 250*).—This is a comprehensive treatise on milk with particular reference to its biological properties, and is an elaboration of a course on the sanitary aspects of milk supplies which the author formerly gave at the University of Chicago. The volume deals with the physiology of lactation, the physical and chemical properties of milk, adulteration of milk, enzyms, toxins and antibodies in milk, germicidal action of milk, the bacteriological examination of milk and the kinds of microorganisms present, milk-borne infections, fermented milks, certified milk, pasteurization and other methods of reducing the microflora, control of milk supplies, economic aspects of milk production, butter, cheese, ice cream and ices, condensed and desiccated milks, and milk from mammals other than the cow. I. A. Abt and A. Levinson contribute a chapter on Milk in its Relation to Infant Feeding. Each of the 24 chapters ends with a bibliography.

Should the short-time test be continued? R. R. Graves (*Hoard's Dairyman, 58 (1919), No. 18, pp. 824–826*).—The author answers this question definitely in the negative. The seven-day test as at present conducted is considered a misleading indication of a cow's ability to produce butter fat, and an almost worthless basis for purchasing breeding stock.

Importance of sterilization in the successful operation of milking machines, G. H. Hart (*Pacific Dairy Rev., 23 (1919), No. 26, pp. 12–15*).—Two experiments are reported which indicate that one cause of failure to secure complete sterilization of milking machine parts by the use of disinfecting fluids is the fact that rubber or traces of milk cause rapid oxidation of the contained chlorin, the solutions thus becoming worthless as germicides. It is also noted that rubber tubing subjected to frequent boiling does not deteriorate as rapidly as is commonly assumed.

Dairy bacteriology.—II, Bacteriology of cream, butter, and cheese, W. Stevenson (*Trans. Highland and Agr. Soc. Scot., 5. ser., 30 (1918), pp. 97–125*).—The author discusses the rôle of bacteria in butter making and in the manufacture of Cheddar and Dunlop cheese, and reports briefly a series of tests at the West of Scotland Agricultural College Experiment Station in which the use of *Bacillus bulgaricus* as a starter resulted in better flavored Dunlop cheese than the ordinary *Streptococcus lacticus* starter. The success with the former starter is attributed to the fact that *B. bulgaricus* fermentation develops a high acidity fatal to most of the putrefactive organisms.

The first installment of this paper has been noted (E. S. R., 38, p. 781).

The lecithin content of butter and its possible relationship to the fishy flavor, G. C. Supplee (*New York Cornell Sta. Mem. 29 (1919), pp. 101–151 pl. 1*).—The author reports a wide variety of experiments to test the hypothesis that a fishy flavor in butter might be produced by the formation of trimethylamin (which has a characteristic fishy odor) as a result of the decomposition of any lecithin present. No statements as to lecithin in butter could be found in the literature, but qualitative tests by the author revealed its presence, and J. T. Cusick furnished him with data from 12 samples showing a lecithin content ranging from 0.05 to 0.07 per cent (approximately).

Six lots of experimental butter samples (totaling 160) were prepared and submitted to from four to six competent butter judges for comments as to the presence of fishy or other foreign flavor. In making each sample there was added to the cream, the cream and unworked butter, or the unworked butter alone a definite amount of either trimethylamin or one of its fatty acid salts, or a fatty acid, or some combination of these.

"While there are several conflicting opinions as to the presence of the fishy flavor in any particular sample, it is nevertheless evident that the greatest number of positive comments is found in the samples containing trimethylamin in one form or another. . . . Usually the greatest uniformity of such comments is found in the samples containing trimethylamin in unstable form." The trimethylamin butyrate samples were judged fishy more frequently than the samples treated with any of the other substances.

In no case were the check samples fishy. Half of the samples were unsalted, and in each lot the unsalted butter was fishy less often than the salted. The lot containing the largest number of fishy samples was made from raw sweet cream, the substances tested being added to the cream and also worked directly into the butter. Another lot from pasteurized sweet cream with the substances added only after churning contained almost as many fishy samples. The lots showing least fishiness were made from sour cream.

Six samples of fishy-flavored butter found on the market were examined for trimethylamin (by a special micro method) and this substance was found to be present in appreciable quantities. Trimethylamin was absent from two market samples originally judged fishy but which had lost this flavor at the time of analysis.

The acidity, trimethylamin content, and flavor of a number of butter samples held in storage for varying periods were also determined. In some cases the butter was made without experimental additions, in others the cream or the butter was inoculated with lactic acid bacteria, and in still others the cream was acidified with lactic acid. The results indicate that the presence of a certain amount of lactic acid is required for the development of fishy flavors. Allowing for uncertainties in the estimate of flavors, it is also concluded that a thoroughly typical fishy flavor is not developed unless trimethylamin is likewise present.

To discover what biological conditions produce a fishy flavor, cream samples were inoculated with bacteria isolated from fishy butter. Butters made from such cream were judged fishy in a number of cases, particularly where Hammer's *Bacterium ichthyosmius* (E. S. R., 37, p. 686) or another organism (unidentified) had been added. Further studies of the biochemical action of *B. ichthyosmius* indicated that it would decompose cholin (lecithin base) with the liberation of trimethylamin. It is concluded, therefore, that the action of specific bacteria is sufficient if not necessary for the production of trimethylamin in butter.

A list of literature references to lecithin in dairy products and to the fishy flavor of butter is appended.

Testing a new method of pasteurizing milk for cheese manufacturing (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 43 (1917), pp. 54–56*).—Two lots of milk treated with hydrogen peroxid and then held at 125° F. for 30 minutes had a lower bacterial count than ordinary pasteurized milk. A lactic culture was added and the milk made into cheese in the ordinary way. After six weeks in the curing room the cheeses were found to be of very poor quality, lacking body and cheese flavor. The cheese from one lot was gassy and possessed a hydrogen peroxid flavor. *Oidium lactis* and a mixed bacterial flora were present, with lactic acid bacteria predominating.

Experiments in the use of rennet substitutes for cheese making, T. J. McKinney (*Ann. Rpts. Dairymen's Assocs. Ontario, 1916, pp. 111–114*).—Experiments at the Ontario Agricultural College in the use of homemade rennet and pepsin preparations in cheese making are reported.

A mixture of rennet and pepsin is recommended if a sufficient supply of rennet at a reasonable price can not be secured. If it is necessary to use pepsin alone, a slightly higher acidity in the milk is suggested.

The use of pepsin and other substitutes for rennet in cheese making, G. H. Barr (*Ann. Rpts. Dairymen's Assocs. Ontario, 1916, pp. 55–59*).—The author has tested the value of various proprietary coagulants containing pepsin for cheese making. With most of the preparations the cheeses were of good quality, but there was a greater loss of fat in the whey than when rennet was used.

Some further notes on the use of pepsin in the manufacture of cheese, G. H. Barr (*Ann. Rpts. Dairymen's Assocs. Ontario, 1917, pp. 112–114*).—Experiments made at the Finch Dairy Station on the influence of temperature and amount of pepsin on the fat content of the whey are reported. Data from 106 vats are held to indicate that settling the milk at a temperature under 86° F. and the use of enough pepsin to permit cutting the curd in less than 30 minutes results in a fat loss no greater than that found when rennet extract was used.

VETERINARY MEDICINE.

Digest of comments on the Pharmacopœia of the United States of America and on the National Formulary, M. I. Wilbert (*Pub. Health Serv. U. S., Hyg. Lab. Bul. 105 (1916), pp. 516*).—This bulletin consists of brief abstracts of articles of interest in connection with the U. S. Pharmacopœia and the National Formulary appearing in pharmaceutical, medical, and chemical literature during the year 1914. The preceding edition of this series has been previously noted (E. S. R., 32, p. 875).

Digest of comments on the Pharmacopœia of the United States of America and on the National Formulary, A. G. Dumez (*Pub. Health Serv. U. S., Hyg. Lab., 1919, Buls. 118, pp. 455; 119, pp. 316*).—These bulletins continue the series noted above for 1915 and 1916, respectively.

Chronic phlegmon with sclerosis and its treatment with autogenous serum, R. Middeldorf (*Berlin. Tierärtzl. Wchnschr., 34 (1918), No. 49, pp. 475–478*).—The successful treatment of ten cases of chronic ulcerous lymphangitis by injection of autogenous serum is reported.

Experiments on the production of specific antisera for infections of unknown cause.—III, The effects of a serum precipitin on animals of the species furnishing the precipitinogen, P. Rous, G. W. Wilson, and J. Oliver (*Jour. Expt. Med., 31 (1920), No. 3, pp. 253–265*).—In continuation of the studies previously noted (E. S. R., 40, p. 678), this paper reports an investigation of the possible dangers in therapeutic practice of the use of sera exhausted by the methods described, particularly as regards the precipitins present in such sera.

It was found that "there is present in serum of high precipitin titer, produced by the repeated injection of rabbits with the blood-free serum of guinea pigs or dogs, a principle highly toxic for animals of the species furnishing the antigen. Intravenously the serum causes severe shock, and even sudden death, while locally it gives rise to acute inflammatory changes and profuse capillary hemorrhages. The complete removal of hemolysins and hemagglutinins from the serum by exposing it repeatedly to washed red cells lessens its toxicity to only a slight degree and one obviously dependent on these elements, while the further removal of precipitin by specific precipitation in vitro has no detoxifying effect whatever. Whether the toxic principle is a hitherto unrecognized antibody or perhaps a toxic product of the interaction of precipitin and precipitinogen, one formed as readily in the test tube as in the animal body, remains to be determined."

These results are considered to be of a discouraging nature from the point of view of the utilization of the serum of infected human individuals as antigen, unless some means can be found for nullifying the action of this toxic principle.

Serum sickness following injection of bovine serum, A. NETTER and COSMOVICI (*Compt. Rend. Soc. Biol.* [*Paris*], *82* (*1919*), *No. 28, pp. 1152, 1153*).—The authors report that in their experience bovine serum has not shown the superiority attributed to it by Penna (E. S. R., 40, p. 582) for the treatment of various diseases. Several cases are reported in which severe serum sickness resulted from its use.

Pneumococcus cultures in whole fresh blood.—I, The retardative effect of the blood of immune animals and the mechanism of the phenomenon, C. G. BULL and L. BARTUAL (*Jour. Expt. Med.*, *31* (*1920*), *No. 3, pp. 233–251*).—This paper reports a study of the alleged pneumococcidal property of the whole blood of normal and immune animals of different species with the technique described by Heist et al. (E. S. R., 40, p. 286.)

The observations noted indicate that the whole, uncoagulated blood of immune animals is not so highly pneumococcidal in vitro as has been claimed by the above authors (E. S. R., 41, p. 577) and others, but that it merely retards the multiplication of pneumococci, the relative lengths of the latent periods of the cultures corresponding in a general way to the relative resistance of the animals to infection by these organisms. The blood of animals artificially immunized, both actively and passively, was found to have a similar retarding effect on the growth of pneumococci. On microscopic examination, cultures of pneumococci in immune blood showed chain formation, growth in clumps, and phagocytosis of the organisms by the polynuclear cells, the growth occurring first in the free serum and later in the clot.

"The retardation of multiplication depends on two factors, opsonization of the pneumococci by the immune serum and phagocytosis of the organisms by the polynuclear cells; growth readily occurs when either agent is absent. Pneumococci multiply in defibrinated immune blood because few phagocytes are present after defibrination. Pneumococci grow in the most potent immune blood after mechanical destruction of the white cells."

The cultural differentiation of beta hemolytic streptococci of human and bovine origin, J. H. BROWN (*Jour. Expt. Med.*, *31* (*1920*), *No. 1, pp. 35–47*).—The fact that hemolytic streptococci are common in good dairy products and are usually harmless to the consumer makes it desirable that such streptococci be distinguishable from the hemolytic streptococci pathogenic to man which are also at times found in dairy products. This has led to the studies here reported which were conducted by the Department of Animal Pathology of the Rockefeller Institute for Medical Research at Princeton, N. J. The details of the investigation are presented largely in tabular form.

None of the procedures described by the author serves by itself to differentiate streptococci of human and bovine origin with certainty, but each of them serves as a strong presumptive test. Most strains fall easily into the human or bovine group by all the tests.

Dairy infection with Streptococcus epidemicus, J. H. BROWN and M. L. ORCUTT (*Jour. Expt. Med., 31 (1920), No. 1, pp. 49–70, pl. 1*).—"A streptococcus epidemic of moderate extent and severity was characterized by clinical symptoms different from the usual septic sore throat, though the organism found was culturally *S. epidemicus*. The infection was traced to the milk from a single quarter of the udder of a cow in a dairy of 112 cows producing an otherwise excellent grade of raw milk. A number of the milkers on the dairy farm [which produced a high grade of raw milk for sale in Boston] were found infected. It was impossible to trace the infection of the cow's udder to any one of the milkers, though such an infection seems probable since the streptococcus isolated from the cow was in every respect like streptococci isolated from patients and milkers, and different from those usually found in normal cows or cows with garget.

"Certain recommendations are made to safeguard producers of raw milk against the occurrence of such epidemics."

Paratyphoid abortion in mares and its relation to abortion in cows, W. STICKDORN and O. ZEH (*Berlin: Tierärztl. Wchnschr., 35 (1919), Nos. 39, pp. 365–367; 40, pp. 377–379*).—The authors report that of 73 cases of abortion in mares examined during the past 4 years 47 of the aborted fetuses were found on bacteriological examination to contain paratyphoid bacilli, and 3 both paratyphoid and streptococcus bacilli, thus indicating the paratyphoid bacillus to be the predominating cause of abortion in mares. Abortion due to this organism is further differentiated from that caused by the abortion bacillus of Bang through the acute course of the disease, which manifests itself particularly in the septic alterations of the fetus. Serological methods alone failed in a number of cases examined, indicating that only a positive finding is to be considered reliable.

Attention is called to the value as an immunizing agent against the paratyphoid bacillus of the preparation parabortin previously described by Zeh (E. S. R., 42, p. 273).

The valuation of the new symptomatic anthrax vaccine (Emphysarcol), H. FOTH (*Berlin: Tierärztl. Wchnschr., 34 (1918), No. 18, pp. 171–175*).—This article summarizes the investigations of the author concerning the standardization and proper use of the symptomatic anthrax (blackleg) vaccine previously noted (E. S. R., 28, p. 376) and more fully described later.[1]

The vaccine is prepared from highly virulent, spore-containing, blackleg cultures, and contains water-soluble proteins, killed bacilli, living spores, and the metabolism products of the bacilli. It is used in two forms, type A, a turbid solution containing numerous spores attenuated by heat, and type F, a filtered spore-free solution. The two types are used simultaneously, type A being injected into the tail, and type F into the front of the ear.

Epizootic lymphangitis, H. VELU (*Rev. Gén. Méd. Vet., 28 (1919), Nos. 331, pp. 349–368; 332, pp. 413–432; 333, pp. 491–504*).—This is a summary of information on epizootic lymphangitis of the horse dealt with under the headings of history, epidemiology, etiology, symptomatology, pathological anatomy, diagnosis, prognosis, prophylaxis, and treatment. A bibliography of 63 titles is appended.

Vaccination experiments against rinderpest with the method of serum vaccination of Schein, P. CROVERI (*Bul. Soc. Path. Exot., 12 (1919), No. 8, pp. 487–489*).—A comparative study of the method of immunization against rinderpest proposed by Schein (E. S. R., 38, p. 484) and the method of Kolle and Turner is reported. The conclusion is drawn that the method of Schein is less reliable and does not confer so lasting an immunity as the original method of Kolle and Turner, of which it is a modification.

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[1] Berlin. Tierärztl. Wchnschr., 32 (1916), No. 11, pp. 121–123.

The significance of lipoids in resistance to tuberculosis, J. de Seixas Palma (*Centbl. Bakt. [etc.], 1. Abt. Orig., 83 (1919), No. 3, pp. 231–254, figs. 5*).—An investigation of the possible influence of the lipoids of various organs on resistance to tuberculosis is reported and summarized as follows:

The lipoids of the lymph glands of tuberculous cows when dissolved in olive oil or emulsified in bile produced edema or necrosis and even death when injected into experimental animals. The same lipoids converted into soap and separated into their saturated and unsaturated fractions proved equally poisonous.

The iodin numbers of the lipoids of the mesenteric glands and of the pancreas showed a marked contrast in reference to tuberculosis. The free lipoid acids of the mesenteric glands of tuberculous cows contained more unsaturated groups than the parent substance and than the analogous acids from healthy glands. The contrary was true of the pancreas, the healthy glands having a higher iodin number than the pancreas of tuberculous animals. These findings are thought to indicate that the mesenteric glands of tuberculous cows contain poisonous compounds of the tubercle bacilli, due theoretically to the lack of fat-splitting ferments which are found in large numbers in the pancreas. The saturated soap fractions from the pancreas of tuberculous cows were never poisonous and contained no substances giving a positive ninhydrin reaction. It is pointed out in this connection that the lymph glands in tuberculous herds have often been found to be tuberculous, while such is never the case with the pancreas.

A constant and marked difference between the lipoids of healthy and tuberculous animals was noted, the latter having a lower melting point and darker color, turning brown on warming. The activity of these preparations in tuberculosis was demonstrated through the phagocytosis and digestion of the soaps from tuberculous cows gave good results in the ophthalmic treatment of myelin figures and the heightened solubility of the isolated fat of the tubercle bacilli. In intraperitoneal experiments it was demonstrated that the pancreatic soaps incited the leucocytes to phagocytosis. The saturated pancreatic soaps from tuberculous cows gave good results in the aphthalmic treatment of dogs with tuberculous eye infection of the human type. Similar unsaturated soaps caused marked irritation when injected subcutaneously into guinea pigs.

The author concludes that the saturated pancreatic soaps of tuberculous cows form the best agent for the attenuation of tubercle bacilli of the human type.

Possible failure of tuberculin in cows during gestation and after calving, R. Bissauge (*Rev. Gén. Méd. Vét., 28 (1919), No. 356, pp. 679–681*).—Evidence is given to indicate that the intradermal as well as the subcutaneous tuberculin test is likely to fail in tuberculous animals in the last two months of gestation and for about ten days after calving.

Tuberculosis in horses, M. Schlegel (*Berlin. Tierärztl. Wchnschr., 34 (1918), No. 52, pp. 501–504*).—This is a review of the literature of tuberculosis in horses, together with descriptions of four authentic cases of different types as follows: Primary tuberculosis of the lungs with tumor-like formation, primary tuberculosis with extensive nodule formation, primary skin and muscle tuberculosis originating in a shell wound in the left forearm, and intestinal tuberculosis. The danger is pointed out of confusing tuberculosis with glanders through similarity in nodule formation.

Tick fever in Palestine, F. D. NICHOLSON (*Brit. Med. Jour., No. 3077* (*1919*), *p. 811*).—The author reports finding recurrent fever in white troops stationed in Palestine to have been transmitted by *Argas persicus*.

Microbabesia divergens in Netherlands Indies, J. C. F. SOHNS (*Dept. Landb., Nijv. en Handel* [*Dutch East Indies*], *Veeartsenijk. Meded., No. 28* (*1918*), *pp. 75, pls. 3*).—The author reports on the discovery in 1917 of a small babesia in slaughtering cattle, recently brought from Australia to Java, which is distinctly smaller than *Babesia bigemina* and occurs in the peripheral blood, mostly in slender forms but in hitherto unknown periods. "It also appears in the spleen and liver but is most numerous in the kidneys, in which inner organs it assumes a shorter and plumper, often an almost round, shape, probably indicating a resting stadium. This rounded form also prevails in blood smears taken a certain time after death. . . .

"For this parasite, already known by three names, *Babesia bovis*, *B. divergens*, and *Piroplasma argentium*, I propose the name *Microbabesia divergens*, giving better than others the characteristic peculiarities, i. e., the smallness and the divergence. The symptoms in the beginning are often indistinct [and do not] present any marked difference from that of Texas fever; redwater, however, is not constant, but icterus occurs more frequently, a symptom that Smith and Kilborne did not mention in their description of Texas fever."

This disease causes less severe losses than Texas fever. Inoculation with microbabesia causes a mild affection, which is followed by immunity. *Margaropus australis* is said to be the intermediate host in Java.

A list of 65 references to the literature is included.

Researches upon a spirillum associated with abortion in ewes, C. M. CARPENTER (*Cornell Vet., 9* (*1919*), *No. 4, pp. 191–203, pls. 3*).—The first part of this paper, consisting of a review of the literature and particularly the work of McFadyean and Stockman (E. S. R., 30, p. 684) on the subject, is followed by an account of an outbreak of abortion in a flock of 235 yearling ewes in New York State. In a bacteriological examination of the affected animals there was recovered in cultures a spiral-shaped actively motile organism which in some cases was mixed with a streptococcus.

The purification and concentration of hog cholera serum, E. RECORDS (*Jour. Amer. Vet. Med. Assoc., 56* (*1919*), *No. 3, pp. 291–302*).—The investigation discussed in this article was undertaken at the Nevada Experiment Station for the purpose of determining the feasibility from a commercial and economic standpoint of subjecting hog cholera serum to a refining and concentrating process analogous to that used in making the globulin products from diphtheritic and tetanic serums.

The general procedure followed was to free the virulent blood from hemoglobin and cellular débris by the use of sodium citrate, sodium chlorid, or the sodium chlorid and navy bean extract method of Dorset and Henley (E. S. R., 35, p. 488), and then to precipitate the diluted plasma with saturated ammonium sulphate by the method of Homer (E. S. R., 35, p. 680), with slight modifications.

It was found possible to recover practically the entire antibody content of hog cholera serum in a single precipitation by the addition of 55 per cent of ammonium sulphate. The subsequent final clarification and sterilization of the solutions of such precipitates by passage through a bacteria-retaining filter was, however, found to be exceedingly difficult and almost impossible in practical amounts. "No attempt at chemical clarification of the final solutions before filtration was made, and there may still be possibilities along this line, or perhaps some modification or refinement of the precipitation method might overcome the difficulties of final filtration."

The author concludes that "the commercial production of such a globulin product is probably not justified at this time owing to the high cost as compared to the very satisfactory sterile, clear, antihog-cholera serum now on the market at a reasonable price."

Production and use of antihog-cholera serum, W. J. Lopp (*Amer. Jour. Vet. Med., 15 (1920), No. 1, pp. 13, 14*).—Statistics are given of the amount of hog cholera serum produced yearly from 1915 to 1919, inclusive, in all United States' licensed establishments. From these figures and the estimated number of hogs in the United States during the same period the percentage of hogs vaccinated yearly has been calculated, the results being 6.45, 6.57, 7.41, 14.8, and 10.67 per cent, respectively. The decrease in 1919 over the preceding year is attributed to the rather indiscriminate use of hemorrhagic septicemia and mixed infection bacterins in place of hog cholera serum. The importance is emphasized of a differential diagnosis before using these bacterins.

The percentages of loss of hogs from hog cholera for the years 1913 to 1918, inclusive, are estimated as 9.91, 10.68, 8.57, 5.99, 4.38, and 3.78 per cent, respectively. The steady decrease in the loss of hogs from this disease is attributed largely to the increased use of the United States' released hog cholera serum.

Diseases of the horse's foot, H. C. Reeks (*Chicago: Alex. Eger, 1918, pp. XXI+458, figs. 165*).—The several chapters of this work deal with the subject as follows: Regional anatomy, general physiological and anatomical observations, method of examining the foot, general remarks on operations on the foot, faulty conformation, diseases arising from faulty conformation, wounds of the keratogenous membrane, inflammatory affections of the keratogenous apparatus, diseases of the lateral cartilages, diseases of the bones, and diseases of the joints.

Treatment of joint-ill with serum from the dam, John (*Berlin. Tierärztl. Wchnschr., 34 (1918), No. 49, pp. 478, 479*).—Attention is called to the possibility of treating advanced cases of joint-ill with serum from the dam. Two case reports are given of foals 9 and 10 weeks old which were cured of severe cases of joint-ill by the intravenous injection of 450 gm. of the serum warmed to 40° C. on a water bath.

The etiology of meningo-encephalitis enzootica (Borna disease) of equines, R. Kraus (*An. Soc. Rural Argentina, 53 (1919), No. 18, pp. 861–867, figs. 4*).—The author's studies have led to the conclusion that Borna disease is caused by a definite diplococcus.

Roup in poultry, W. J. Johnson (*Washington Sta., West. Wash. Sta. Mo. Bul., 7 (1920), No. 10, pp. 166–170, figs. 7*).—This is a popular descriptive account.

RURAL ENGINEERING.

Hydrology: The fundamental basis of hydraulic engineering, D. W. Mead (*New York: McGraw-Hill Book Co., Inc., 1919, pp. XI+647, figs. 356; rev. in Engin. News-Rec., 83 (1919), No. 21, p. 1021*).—This treatise, consisting of material brought together largely from the results of the author's own work, covers the occurrence of water—its distribution and fluctuations in quantity, special attention being given to rainfall phenomena and to observations of atmospheric conditions which control precipitaton. Following this is a discussion of the influence of geology and topography upon the occurrence of ground water and surface run-off water, with a consideration of the causes and effects of floods, the practicability of water storage, and other applications of engineering data. As a conclusion, the author has outlined briefly some of the applications of hydrology. Two general classes of engineering work in which it plays an important part are considered, (1) works for the utilization of water and (2) works for the control of water.

Abundant references to related works are included.

Hydraulics, R. L. Daugherty (*New York: McGraw-Hill Book Co., Inc., 1919, 2. ed., rev. and enl., pp. XVI+267, figs. 252*).—In this, the second edition of this book (E. S. R., 35, p. 786), the new material consists principally of graphical methods of solving certain practical problems, the determining of the economic size of pipe, and problems of flow through compound pipes, branching pipes, pipes with laterals, and through rotating channels.

Second biennial report of the State Water Commission of California, 1917–18 (*Bien. Rpt. State Water Comm. Cal., 2 (1917–18), pp. 19*).—This pamphlet reports the activities of the commission for the years 1917 and 1918, dealing particularly with water rights and calling attention to cooperative work in irrigation investigations with the U. S. Department of Agriculture.

Second report of the State Engineer of New Mexico, J. A. French (*[Bien.] Rpt. State Engin. N. Mex., 2 (1914–1916), pp. 103+[V], pls. 30*).—This report is divided into two parts, one relating to the work and expenditures of the New Mexico State Highway Commission and the other covering the work of the State Engineer for the period from December 1, 1914, to November 30, 1916, and relating to irrigation, hydrographic surveys, stream gauging, protection from the Rio Grande River, and well-digging on State lands.

The value of a hydraulic horsepower at the wheel, E. W. Rettger (*Cornell Civ. Engin., 28 (1919), No. 2, pp. 62–69, fig. 1*).—This is a mathematical analysis of the economic design of penstocks or pipes.

Experiments on the flow of water through contractions in an open channel, E. W. Lane (*Proc. Amer. Soc. Civ. Engin., 45 (1919), No. 8–10, pp. 715–774, pls. 8, figs. 20*).—Studies made in connection with the design of the flood prevention works of the Miami conservancy district, on the laws governing the flow of water through a contraction in an open channel, are reported.

The experiments consisted of measurements of flow through a contraction with rounded edges, 1 ft. wide; a sharp edge contraction, 1 ft. wide; a sharp edge contraction, 2 ft. wide; a short flume with rounded entrance; a short flume with sharp corner entrance; and an expanding or Venturi flume. The apparatus used is described in detail. The most important conclusions drawn from these experiments are as follows:

The manner in which the flow of water through a contraction takes place is entirely dependent on the conditions existing in that particular case. The two most common formulas are those of d'Aubuisson and Weisbach. Under certain conditions, one of these formulas may be applicable and, under another set of conditions, the other; while under still other conditions, neither should be used. The flow through a contraction is intimately connected with the phenomenon of "maximum flow." To explain the conditions of flow in the expanding flume, the theory of back-water curves was developed for a frictionless channel with a level bottom and variable width. Certain forms of contractions were found to possess considerable merit as instruments for the measurement of flowing water.

Appendixes are attached containing (1) a brief description of the application of the theory of flow through contracted openings to the design of the flood-prevention works of the Miami conservancy district, and (2) a description of the unstable state of the stream below a sharp-edged contraction.

Verification of the Bazin weir formula by hydrochemical gaugings, F. A. NAGLER (*Proc. Amer. Soc. Civ. Engin., 44 (1918), No. 1, pp. 3–54, figs. 24*).—This paper presents the results of 23 experiments on a standard Bazin weir 3.72 ft. high and 6.56 ft. wide, conducted at the University of Michigan. The water was measured hydrochemically, tests being made on heads as high as 4 ft. on the weir.

It was found that for heads of less than 2 ft. the discharges, as given by the salt solution gaugings, were higher than those computed by the Bazin weir formula. For heads greater than 2 ft., the Bazin formula gives discharges which are greater than those obtained in this set of experiments. This attains a maximum difference of 0.6 per cent at a head of 4 ft. The salt solution experiments which lie within the range of the Bazin experiments coincided with the Bazin formula and experimental curve more closely than the Bazin experiments themselves. The results of the high head experiments fitted the Bazin formula more closely than they would fit the probable extension of the Bazin experimental curve. "In claiming that the Bazin formula gives actual discharge within 1 per cent, within the range of his experiments, this formula is all that its author maintains. There is, however, further merit for the Bazin formula, in that this statement proves to be valid for heads as high as 4 ft. on a weir 3.72 ft. high. The Bazin weir formula is thus extended 100 per cent beyond its original legitimate field of application."

A comparison between the results of these experiments and the Bazin, Fteley and Stearns, Francis, and King formulas leads to the conclusion that "the agreement with the Bazin experimental curve is remarkably good, except for the low heads. The Bazin formula approximates these experiments within 1 per cent for all discharges listed. The Fteley and Stearns formula gives good results for the highest heads, but gives discharges too small for heads of less than 1 ft. The Francis formula does not agree with these experiments. The discharges vary from 1.4 to 4.75 per cent, and are lower than the hydrochemical experiments for both low and high heads on the weir. The King weir formula approximates these experiments very closely for nearly all heads; in fact, it seems to fit the data better than any of the existing formulas, except for a divergence of 1.25 per cent at the lowest head."

The methods of hydrochemical and weir gauging used are described.

Study of pressures in hydraulic dam cores (*Engin. News-Rec., 83 (1919), No. 22, pp. 1040–1041, figs. 7*).—This report describes methods used by the engineers of the Miami conservancy district to obtain data on core consistency and action and on lateral and vertical pressures. The Goldbeck pressure cell apparatus is being used to obtain data on core consistency and action and lateral and vertical pressures. Resistance to penetration or supporting power of dam cores is being gauged by lowering a 6 in. cast-iron ball into the pool by a rope, its penetration under its weight being recorded.

River discharge, H. CHATLEY (*Engineering* [*London*], *108 (1919), No. 2801, p. 322; also in Engin. and Contract., 52 (1919), No. 18, p. 493*).—In the course of investigations made during the past three years as to the regulation of the Whangpoo and Yangtze Rivers, comparisons were made of the various discharge formulas on large streams with irregular flow.

It was found that all the standard formulas have no applicability whatever to natural sinuous and irregularly sectioned streams because of the dissipation losses at the bends and changes of section. The energy so lost may easily amount to as much as the friction head obtained from the formulas. In fairly straight and uniformly sectioned reaches when the flow is steady the exponential form

$$V=C.R^{0.7}.I^{0.5} \ldots$$

gives consistent results, I being the local slope or tangent to the water surface at the measuring section. When the flow was unsteady in regular channels, the velocity followed this form:

$$V=CR^{0.7}\left(I-\frac{a}{g}\right)^{0.5} \ldots$$

where a is the acceleration. In other words, the effective slope is equal to the algebraic difference between the actual slope and an acceleration slope determined by the ratio of the actual mean acceleration of the water to the gravitational acceleration.

Surface water supply of St. Lawrence River Basin, 1917 (*U. S. Geol. Survey, Water-Supply Paper 454* (*1919*), *pp. 124+XXXIII, pls. 2*).—This report, prepared in cooperation with the States of Minnesota, Wisconsin, New York, and Vermont, presents the results of measurements of flow made on streams tributary to the Great Lakes and the St. Lawrence River during the year ended September 30, 1917.

Surface water supply of Hudson Bay and upper Mississippi River Basins, 1917 (*U. S. Geol. Survey, Water-Supply Paper 455* (*1919*), *pp. 207+XXX, pls. 2*).—This report, prepared in cooperation with the States of Minnesota, Wisconsin, Iowa, and Illinois, presents the results of measurements of flow made on streams in the Hudson Bay and upper Missisippi River drainage basins during the year ended September 30, 1917.

The seasonal variation in the reaction and hardness of river water in India, W. C. Ross and K. N. Bagchi (*Indian Jour. Med. Research, 6* (*1919*), *No. 4, pp. 423–429, figs. 4*).—Twenty-one months' studies on Ganges River waters and nine months' studies on Sone River waters showed that these waters become acid in reaction during the monsoon period. This change from alkaline to acid reaction was found to be a definite natural process of seasonal variation of alkalinity in river waters.

The effect of the acidity in reaction on sedimentation was to delay the formation of aluminum hydrate, to produce a less firm coagulum with diminished powers of sedimentation, and also to upset completely the calculation of the quantity of alum required. It was found by experiment that the addition of lime so as to render the water definitely alkaline, restored the conditions necessary for good sedimentation. The acidity was demonstrated to be due to the presence of free carbon dioxid in the water, boiling of which caused a temporary return to alkalinity in reaction, which again was followed by a gradual return to the previous condition of acidity. It was also found by experiment that the acidity could be greatly reduced by the use of an air pump to remove carbon dioxid from the water.

The theory is advanced that this change in reaction is due to catalytic action, decomposing the calcium bicarbonate and liberating carbon dioxid, and that the fine sediment which is present in these river waters after the strong west winds are established and when the rivers rise is the catalytic agent.

Classification of springs, K. Bryan (*Jour. Geol., 27* (*1919*), *No. 7, pp. 522–561, figs. 23*).—This is an extensive discussion of springs, made for the purpose of providing a series of terms expressive of genesis which will include all springs. Springs are divided into two main classes: Class 1, springs due to deep-seated waters, include volcanic springs and fissure springs; class 2, springs due to meteoric and occasionally other waters moving as ground water under hydrostatic head, include depression springs, contact springs, artesian springs, and springs in impervious rock.

Farm water supply, F. H. PETERS (*Dept. Int. Canada, Irrig. Div. Bul. 5 (1919), pp. 27, figs. 11*).—This is a semitechnical bulletin, prepared for distribution among the farmers of the semiarid districts of Alberta and Saskatchewan, with a view to aiding them in procuring a domestic water supply. The bulletin discusses such subjects as earth reservoirs, dams, rain catchers or cisterns, and methods of purifying water.

It is to be noted that the greater part of the water supplies described in this bulletin are of the surface variety, in view of the semiarid conditions. The methods of purifying water are therefore considered of extreme importance. These include boiling, chemical treatment with chlorid of lime, filtration, and distillation. Sand filtration is apparently generally recommended. However, an illustration of a homemade filter, made out of two casks, is given, which, it is stated, is very efficient. The large cask contains a filter consisting, from the top, of 12 in. of fine sand, 3 in. of fine gravel, 6 in. of animal charcoal, and 3 in. of fine gravel. The water flows through this filter into the second cask, which is a storage chamber.

Chlorination and chloramin, J. RACE (*Jour. Amer. Water Works Assoc., 5 (1918), No. 1, pp. 63–82*).—This paper reports studies on the effect of acids, alkalis, and salts on chlorination of water supplies.

It was found that "the effect of small quantities of sodium chlorid (up to 10 parts per million) is apparently very limited, but larger amounts tend to increase the velocity of the germicidal action of the hypochlorite. Sodium chlorid itself has no effect on the viability of *Bacillus coli* during the period covered, viz, five hours. In quantities up to approximately 5 parts per million caustic potash has but little effect. At 5 to 10 parts per million the velocity of the germicidal action is materially reduced, but when higher amounts are present the germicidal action of the alkali itself begins to take effect and may entirely nullify the retarding effect on the hypochlorite. . . . Small amounts of acid, whether added as a strong mineral acid or a weak acid such as carbonic acid, increase the velocity of the action in a marked manner. Sulphuric acid alone has a germicidal effect, but insufficient to account for the observed effect of the addition of acid to hypochlorites."

A comparison of various sources of chlorin with bleach showed that chlorin gas and electrolyzed salt are slightly superior to bleach, but the difference has no practical significance. Abnormally high efficiency was obtained with ammonium hypochlorite. Data on practical use of chlorin disinfection for water supplies are also given.

Iron-depositing bacteria and their geologic relations, E. C. HARDER (*U. S. Geol. Survey Prof. Paper 113 (1919), pp. 89, pls. 12, figs. 14*).—This is a report of rather extensive investigations on the iron-depositing bacteria, with particular reference to their existence in soil and in water supplies. It was found that, in addition to the iron-depositing bacteria proper, probably many of the common bacteria of soil and water are active in precipitating iron compounds. A critical summary of the works of others bearing on the subject and a bibliography are included.

Duty of water in irrigation, W. L. POWERS (*Oregon Sta. Bul. 161 (1920), pp. 20, fig. 1*).—A summary is given of 12 years' irrigation experiments on brown silt loam soil of good fertility, conducted partly in cooperation with the U. S. Department of Agriculture.

The data reported are based on about 600 seasonal plat products and some 30,000 soil moisture determinations. Staple field crops were grown on duplicate one-tenth acre plats under field conditions and measured quantities of irrigation water pumped from a creek were used. A summary of the 12 years' experiments indicates that all crops gave an increase from the use of water, and in all cases the profits have been substantially larger where the crop was raised under irrigation. Except for corn, the water cost of dry matter has been distinctly less with irrigation, the difference being on the average 15 to 20 per cent less. The gain in net profit per acre for the irrigation treatment over the dry treatment ranged on the average from 87 cts. with corn to $23.96 with potatoes.

It was found that alfalfa and other meadow crops required relatively large amounts of water, and without irrigation their growth is checked in June. Two irrigations gave better results than one in dry seasons, the water being applied for the third and fourth cuttings. With a good head of water the strip border method of irrigation was found to be adapted to this silt loam soil, while with a smaller head the use of the corrugation method was necessary.

"Potatoes, beans, and other cultivated crops require in this climate only a moderate amount of supplemental irrigation. With beans, one moderate soaking at the time they are coming into full bloom followed by thorough cultivation is generally the most profitable. With potatoes, a uniform moderate moisture content is the important factor in keeping them growing at an even rate. This is best maintained by moderate irrigation when the potatoes are coming into bloom and further irrigation when they have about finished blooming. Beets have been more profitable under irrigation than corn or kale. They make their growth late in the season and are somewhat benefited by a second irrigation. It may not be profitable, however, to apply late irrigation, or a second irrigation, to beets, except in dry seasons. Grain, when planted in the fall is not itself greatly benefited by irrigation, though some increase in yield has been obtained." Spring grain in dry seasons has been very substantially benefited by irrigation.

Data on the economic duty of water showed that the following average quantities of water gave the most profitable returns: Beets 11.38 in., beans 8.6, grass 21.28, alfalfa 20.64, clover 19.28, and potatoes 10.12 in. Data on the effects of rotation on the economical use of water showed a difference of $6.63 net profit per acre in favor of the irrigated rotation. Rotation both with and without irrigation resulted in an increase in yield and profit and a decrease in water cost. With irrigation, increase in yield and profit was greater especially in the closing years of the period.

The factors affecting the economical use and duty of irrigation water are summarized in some detail.

Irrigation in the Fourteenth Census of the United States, R. P. Teele (*Engin. News-Rec., 83 (1919), No. 20, pp. 926, 927*).—This is a brief outline of the inquiries to be included in the fourteenth irrigation census.

Life of flume prolonged by roofing paper lining (*Engin. News-Rec., 84 (1920), No. 3, p. 131, figs. 2*).—This is an account of experiments with a leaky wooden flume in an irrigation district in southern California. After other means of stopping a 50-per-cent leakage had failed, roofing paper was used and resulted in keeping the leakage below 10 per cent for five years. Three types of paper lining were experimented with, and the successful type was applied as follows:

The flume was first strengthened and plugged and the seams mopped with asphalt. The felt lining was applied while the asphalt was still hot, thus forming a tight bond between the lining and the flume joint. Laps in the lining at joints were nailed with large flat-headed roofing nails. The roofing paper was placed on top of the lining and mopped with hot asphalt.

Self-cleaning screen for small canals (*Engin. News-Rec., 84 (1920), No. 3, p. 128, figs. 3*).—A self-cleaning screen for excluding floating solids, leaves, and other débris from small canals is described and illustrated.

Tile drainage, J. A. King (*Mason City, Iowa: Mason City Brick & Tile Co., 1918, pp. [VIII]+63, pls. 6, figs. 42*).—This is a popular treatise on the subject of farm tile drainage, in which an explanation is given of how and why tile drainage will benefit the soil, together with instructions for the proper installation of tile drainage systems under different conditions. The author apparently favors the use of clay tile in this work, although he takes up briefly important points to be considered in the selection of cement tile.

Determination of Kutter's roughness in a drainage ditch, R. Bosard (*Engin. News-Rec., 83 (1919), No. 20, pp. 921, 922, figs. 5*).—Experiments on the value of *n* in Kutter's formula, made on ditches in the Grassy Lake and Tyronza drainage district in Arkansas, are reported. The soil is a stiff, heavy gumbo and the plant growth is quite dense and profuse.

The average of eight values of *n* was found to be 0.0377. It is concluded that for ditches in soil of this kind the value of 0.03, which is commonly used, is not high enough, and that the value of 0.035 is the one more nearly correct.

The leveling of soils in Egypt, V. M. Mosséri and C. Audebeau Bey (*Bul. Union Agr. Égypte, 16 (1918), No. 125, pp. 81–124, pls. 8, figs. 7*).—This bulletin deals with types of apparatus used, the methods employed, and the cost of leveling agricultural soils in Egypt. Among the tools used for this purpose are plankers, plank drags and scrapers, and scrapers of the inverting type, corresponding to the usual metal scraper except that they are made of plank. This last tool seems to be the one most generally used with the most effective results. Considerable cost data are given in graphic form, showing the relation between cost, depth of scraping, and distance of haul.

Road laws of the State of Idaho, compiled by J. W. Abney and M. H. Eustace (*Boise, Idaho: State, [1918], pp. 214*).—The text of these laws is given as revised to February 1, 1918.

Country Roads Board: Fifth annual report, W. Calder (*Ann. Rpt. Country Roads Bd. Victoria, 5 (1918), pp. 54*).—This is a report of the activities and expenditures of the Country Roads Board of Victoria for the year 1918. It is noted that loan expenditures on permanent works during the year amounted to about £226,600.

Classification and uses of highways and the influence of Federal-aid acts, T. H. MacDonald (*Engin. News-Rec., 83 (1919), No. 21, pp. 985–988*).—The uses of highways of the United States are classed as agricultural, recreational, commercial, and military, being placed in this order as an indication of the order of their importance as determined by their respective volumes. The important modifications considered necessary in order that the present Federal-aid law may satisfactorily meet the national need for improved roads and the economic needs of individual communities are discussed.

The present status of impact tests on roadway surfaces, A. T. Goldbeck (*Engin. and Contract., 52 (1919), No. 23, pp. 651, 652*).—The author describes the impact tests now being conducted by the Bureau of Public Roads of the U. S. Department of Agriculture, pointing out that their aim is to determine (1) the amount of impact delivered to road surfaces and (2) the effect of this impact on different types of surface.

Brick paving stands first—shows highest percentage in mileage under test (*Brick and Clay Rec., 56 (1920), No. 2, pp. 136, 137, figs. 2*).—In experiments conducted by the Iowa Engineering Experiment Station on the relative tractive resistance of hard-surfaced roads, monolithic brick pavement gave the greatest actual mileage and also the largest ton-mileage per gallon of gasoline. Concrete in good condition was second, followed in order by bitulithic, gravel in excellent condition, and ordinary gravel.

The road-building sands and gravels of Washington, M. M. Leighton (*Wash. Geol. Survey Bul. 22 (1919), pp. 307, pl. 1, figs. 44*).—This bulletin reports the results of field examinations showing the nature, extent, and manner of occurrence by counties of the gravel deposits of the State of Washington, and also reports laboratory tests to ascertain their probable quality for gravel macadam and the various forms of pavement in which sand and gravel are used.

Tests of road gravels for use in gravel macadam showed that practically all of the gravels in the State are firm, durable, and resistant to abrasion. There are few, if any, soft sandstones and shale rocks among them.

Sixty-nine samples of road gravel were tested for their resistance to abrasion. The maximum loss by abrasion on any one of these samples was 32.8 per cent, the minimum loss 2.2 per cent, and the average loss 10.9 per cent. Field tests showed that "most of the coarse aggregates thus far used in cement concrete pavements have a low percentage of wear. The minimum is 2.4 per cent, the maximum 14.8 per cent, and the average 5.2 per cent."

The chief points regarding the sands of the State are also summarized.

The development of concrete road construction, A. N. Johnson (*Reprint from The J. E. Aldred Lectures on Engineering Practice, 1917–18. Baltimore: Johns Hopkins Univ., 1918, pp. 79–111, figs. 4*).—This paper includes an outline of the development of the use of the concrete road, as well as the development of various features of construction. The practical application of the results of investigations and research are also pointed out.

With reference to the quality of materials, the conclusion is drawn that the presence of organic impurities in sand is responsible for most defective concrete sands, and that the colorimetric test furnishes a simple and inexpensive method for detecting the presence of such impurities. "It is recommended, in proportioning the materials, that where the coarse aggregate is 2 to 2½ in. in size, and the sand limit is assumed at ¼ in., that the proportions be 1 part cement, 2 parts sand, and 3 parts coarse aggregate. Where the coarse aggregate is limited in size from 1 to 1½ in., it is recommended that proportions be 1 part cement, 1½ parts sand, and 3 parts coarse aggregate. It will be found that the resulting concrete will be of approximately the same strength in each instance. . . .

"As a result of careful observation of something over 30,000,000 sq. yds. of concrete roads, some of which were reinforced and some were not, the conclusion is reached that the reinforcement that has been used, generally averaging about 28 lbs. of metal per 100 sq. ft. of pavement, has not lessened the number of cracks, but has had a marked influence on the width of the cracks that have formed. That is, in the nonreinforced roads a far larger proportion of the cracks have opened sufficiently to become noticeable and require filling with tar or asphalt for proper maintenance. On the reinforced roads a majority of the cracks have not opened up sufficiently to be casually noticeable and have not required any filling. The cracks which occur are usually transverse or longitudinal. Most transverse cracks are occasioned because of the shrinkage in the concrete due to setting. . . .

"The removing of the excess water makes the resulting concrete stronger . . . Laboratory tests made upon slabs of concrete, some of which were rolled and others wood-floated, but otherwise of identical workmanship and materials, showed that the rolled concrete had a cross breaking strength approximately 20 per cent greater than the wood-floated slab."

Reinforced concrete roads, their construction, maintenance, and life, W. M. JONES (*Engineering* [*London*], *108* (*1919*), *No. 2813, pp. 733–735*).—This is a review of British practice in reinforced concrete road construction, in which the author reports certain special details of construction which he has found to be satisfactory.

He is of the opinion that drainage of the road bed is vital, and that the subsoil should be of uniform density and should be thoroughly consolidated. The aggregate used should be clean, hard and tough, and free from foreign matter, and the sand should be coarse and well-graded. A well-mixed, rich concrete, accurately proportioned, should be used and not sloppy concrete. Reinforcement is considered necessary in British practice, not only to strengthen the concrete but to prevent cracking. Rapid drying should be prevented. It is concluded that from the British viewpoint a reinforced concrete road properly made is to-day the most efficient and economical type.

Amendments to recommended practice for concrete roads and street construction, H. E. BREED (*Proc. Amer. Concrete Inst.*, *15* (*1919*), *pp. 405–410, figs. 3*).—Recommendations are made regarding mixing, consistency, construction and finishing apparatus, and reinforcing.

Cement-concrete pavements in New Zealand and the United States and Canada, W. E. BUSH (*Engineering* [*London*], *108* (*1919*), *No. 2813, pp. 735–737*).—The author reviews his own experience in the design and construction of concrete roads and pavements in New Zealand and also reviews American and Canadian practices along this line. From his experience the adoption of the following precautions is recommended:

(1) The thorough preparation of the subgrade or foundation, including the use of a suitable steel reinforcement over trenches or holes where subsidence may take place; (2) the use of the very best quality and uniformity of aggregate and cement, and their thorough mixing, with as small a quantity of water as is necessary to insure density of mass and smooth finish; (3) the utmost care in the tamping, screeding, and troweling of the pavement; (4) the keeping damp of the concrete during the process of setting and hardening; and (5) the allowance of ample time for setting, never less than three weeks in summer and four in winter or damp or cold weather, and preferably longer, before traffic is allowed to use the pavement.

Report of the committee on reinforced-concrete highway bridges and culverts, A. B. COHEN (*Proc. Amer. Concrete Inst.*, *15* (*1919*), *pp. 360–372, figs. 7*).—In this report recommendations are made relating to the important assumptions necessary for fixing the effective width carrying a concentrated load on a simple reinforced concrete slab superstructure, and to related items. The points relating to effective width of concrete slabs have, for the most part, been previously noted from reports issued by the Bureau of Public Roads of the U. S. Department of Agriculture. Other conclusions based on work performed at the Lewis Institute and the Highway Department of Ohio are included.

Load concentrations on steel floor-joists of wood floor highway bridges, T. R. AGG and C. S. NICHOLS (*Iowa Engin. Expt. Sta. Bul. 53* (*1919*), *pp. 31, figs. 24*).—An investigation is reported which was undertaken to determine the manner in which heavy wheel loads, such as those of traction engines, are distributed to the various I-beams and channels in a highway bridge floor system consisting of I-beam and channel joists and wood planking, such as is used on secondary roads. The investigation was confined to the determination of (1) the percentage of a wheel load carried by each I-beam and channel joist of a highway bridge carrying a wood floor, for various positions of a certain pair of tractor wheels, (2) the effect of using two layers of floor planks, the upper one being laid (a) lengthwise of the floor, (b) on a diagonal, (3) the effect upon distribution of load of loosening the planks from the nailing pieces, and (4) the effect of the wheel lugs upon the distribution of the load.

It was found that a concentration on a single floor joist equal to 55 per cent of one wheel load is possible where a single thickness of wood floor is laid on the steel floor joists. The concentration on the joists immediately under the wheels is generally increased slightly if the ends of the plank are loosened, but the additional concentration is small. The concentration on the joists immediately under the wheels is slightly reduced by a second layer of floor planks laid lengthwise of the bridge floor. The concentration on the outer I-beam or channel increases rapidly as the load approaches the side of the bridge. The outer joist should have a section modulus as great as that of any other joist in the floor system. The concentration on light I-beams used for joists and placed at intervals is much less than on the heavier I-beam joists with wider spacing, so they may be safely employed if enough are used to insure wheel bearing on two joists.

Developments in 1919 in the use of machinery for highway construction, C. S. Hill (*Engin. News-Rec., 84 (1920), No. 1, pp. 8–10*).—A review is given of progress made in determining types of plant adapted to rapid and economical construction of highways. It is noted that the use of motor trucks and tractor-trailers for material haulage increased.

Southern yellow pine (*New Orleans, La.: Southern Pine Assoc., 1918, 6. ed., rev., pp. 136+X, pl. 1, figs. 33*).—This is the sixth edition of this handbook, which contains tables and formulas for use in the design of structures of yellow pine.

The conservation of wood, T. Wolff (*Forstwiss. Centbl., 40 (1918), No. 10, pp. 372–387*).—This article deals with German practice in wood preservation, with particular reference to impregnation with metallic salts or antiseptic substances, such as creosotes and tar oils. Some recent American processes are also reviewed, including the sterilization of green timber with an alternating electrical current.

Concrete engineers' handbook, G. A. Hool, N. C. Johnson et al. (*New York: McGraw-Hill Book Co., Inc., 1918, pp. XXIII+885, pls. 2, figs. 983*).—The purpose of this handbook is "to make available in concise form the best of present day knowledge concerning concrete and reinforced concrete and to present complete data and details, as well as numerous tables and diagrams, for the design and construction of the principal types of concrete structures. Although intended as a working manual for the engineer, the first few sections of the book may be read with profit by any one engaged in concrete work. In these sections an effort has been made to present the latest authoritative knowledge in regard to the making and placing of concrete in such form that it may be applied in the field to the betterment of construction."

Principles of reinforced concrete construction, F. E. Turneaure and E. R. Maurer (*New York: John Wiley & Sons, Inc., 1919, 3. ed., rev. and enl., pp. VIII+485, pls. 2, figs. 208*).—This is the third revised edition of this book. Separate chapters are devoted to the theory of flexure, bond and shear, and the design of beams, and a new chapter has been added covering the analysis of flat slabs, including slabs supported on beams as well as the so-called flat slab system of floor construction. The chapter on building construction has been extended to include a more detailed treatment of continuous beams and girders.

Reinforced concrete design tables, M. E. Thomas and C. E. Nichols (*New York: McGraw-Hill Book Co., Inc., 1917, pp. VIII+208, figs. 4*).—This is a handbook of formulas and tables to be used by the designer of reinforced concrete, and includes data for slabs, simple beams, tee beams, double reinforced beams, and square and hooped columns.

Tests of concrete in tension, T. H. Carver and J. H. Quense (*Engin. News-Rec., 83 (1919), No. 21, pp. 1005, 1006, figs. 4*).—The apparatus used is described and tests of concrete briquettes 5 in. square, at ages of from 57 to 609 days, are reported. A mixture of 1:1.42:2.36 was used. The greatest tensile strength of 492 lbs. per square inch was obtained at 609 days, and the tensile strength varied from this amount to 268 lbs. per square inch at 58 days. An interesting development of the test was the fact that the permanent set became negative in some cases.

The solubility of Portland cement and its relation to theories of hydration, J. C. Witt and F. D. Reyes (*Philippine Jour. Sci., Sect. A, 13 (1918), No. 4, pp. 147–163, fig. 1*).—Experiments are reported in which it was found that, when cement is shaken with water in a closed vessel, large amounts of calcium with relatively small amounts of most of the other elements present go into solution. The factors that affect the results have been found to be (1) absence of carbon dioxid, (2) method of agitation, (3) fineness of grain, (4) volume of water, and (5) time. Of these, volume of water is the most important. As the volume of water is increased, the amount of calcium going into solution in a given time increases rapidly. When cement is treated with approximately 8,000 times its weight of water, 90 per cent of the calcium present goes into solution in 24 hours, with indications that still more would dissolve in a greater volume. Though the work was not undertaken as a study of hydration, the results obtained are closely related to the theories of hydration that have been formulated from time to time.

"Since all the important compounds in cement contain calcium and 90 per cent of all calcium present goes into solution, it may be stated that under favorable conditions the hydration of all important compounds results in the formation of calcium hydroxid. It has not been found possible to obtain a saturated solution of calcium hydroxid by shaking cement in water. This may be due to the fact that presence of dissolved calcium hydroxid inhibits further hydration, or it may be that when the concentration of the calcium hydroxid solution reached a certain value a colloid is formed, according to Michaelis' theory."

Some generalizations on the influence of substances on cement and concrete, J. C. Witt (*Philippine Jour. Sci., Sect. A, 13 (1918) No. 1, pp. 29–48*).—A review of the work of others bearing on the subject is given, and experiments reported on the action of solutions of the chlorids and sulphates of sodium, zinc, and copper, the nitrates of sodium, potassium, and ammonium, and the bicarbonates of sodium and potassium on briquettes made from each of four brands of cement. Four concentrations of each of the solutions were used.

It was found that the general tendency of all the solutions is to decrease the tensile strength. Of the 352 results (which represent 1,056 briquettes), only 44 showed an increase in strength and, as a rule, this increase was small. The greatest number of such cases occurred with the sulphates. The increases occurred mostly with cements containing the most sulphates, and with the 1 and the 0.5 normal solutions.

The decreases in tensile strength were most prominent with the 7-day briquettes, and the principal ones were with the maximum concentration of each solution employed. Cement containing the most iron, lime, and magnesia and the least sulphates was the most sensitive to the effect of the solutions in lowering the tensile strength. With this cement, every solution used caused one or more series of briquettes to fall below the specified limits. Apparently there was no relation between the effect of the solutions on the set and on the tensile strength. On the basis of their effect on the set, the salts may be divided into two groups: (1) Sodium chlorid, sodium nitrate, potassium nitrate, ammonium nitrate, sodium sulphate, sodium bicarbonate, and potassium bicarbonate; and (2) zinc chlorid, copper chlorid, zinc sulphate, and copper sulphate.

When a member of the first group was added to a cement, a small amount of the salt caused a retardation of the set. After a maximum point was reached, the set was accelerated by further additions of the substance until the original setting time was reached or even passed. The second group showed a retardation with the lowest concentration of each solution employed, and this increased with increasing concentration. For the ranges studied the time-concentration curves of these salts rose indefinitely. This was contrary to the corresponding curves of group 1, which passed through maximum points. With the salts investigated, the positive ion was more important than the negative in determining the effect of an electrolyte on cement. There was no well-established relationship between this effect and the solubility of any calcium compounds that may be formed.

Concrete hardening accelerated by calcium chlorid (*Concrete* [*Detroit, Mich.*], *15* (*1919*), *No. 3, pp. 125, 126*).—The results of an investigation conducted by the U. S. Bureau of Standards on means of accelerating the rate of increase in the strength of concrete are reported.

It was found that the gauging of concrete with solutions containing small amounts of calcium chlorid gave the most efficient results. Several other chemicals were tried with no practical beneficial effect, namely, ammonium hydroxid, ammonium carbonate, sodium phosphate, sodium sulphate, sodium hydrate, sodium carbonate, oxalic acid, potassium sulphate, and sulphuric acid. In the mortar tests in mixtures of 1:3 Ottawa sand, the addition of from 1 to 5 per cent of commercial calcium chlorid to the mixing water did not materially affect the time of set of the cement. By using 2 to 4 per cent calcium chlorid the tensile strength of the mortars was increased from 155 to 230 per cent at an age of 24 hours, and from 173 to 190 per cent at an age of 48 hours. In the various mixtures of Potomac river gravel concrete, the addition of 4 per cent commercial calcium chlorid to the mixing water gave consistently the best strength increase; in some samples this was specially noticeable at early ages. The use of pure calcium chlorid gave strengths about 30 per cent above those attained with the use of commercial calcium chlorid.

Further experiments to determine the strength and durability of concrete containing small amounts of calcium chlorid under various curing conditions and to ascertain the effects of such additions on the corrosion of metal reinforcing are also reported. The effect of the addition of calcium chlorid on the compressive strength of 1:3 standard sand mortar was to give a marked percentage of increase. Under freezing conditions, the calcium chlorid treated concrete showed the same marked percentage of increase in strength as the specimen cured in the laboratory. Results of the corrosion tests showed that at the end of a year in both the 1:2 and 1:3 mortars gauged with 4 per cent calcium chlorid, both with the galvanized and the plain expanded metal lath, that the metal had been attacked varying in amount from a few rust spots on the galvanized lath to complete rusting through in some cases of the plain lath. Lath embedded in 1:3 mortars not gauged with the calcium chlorid examined at the same time showed the metal absolutely clean, with no indications of corrosion. In the cases of the rods embedded in 1:2 and 1:3 mortars and concretes of mixes of 1:1½:3 and 1:2:4 proportions, gauged with 6 per cent solution of calcium chlorid, all the metal had been attacked, showing rust pits, while the rods in the mortars and concretes mixed with plain water were not corroded at all.

Effect of calcium sulphate on cement, J. C. WITT (*Engin. World, 16* (*1920*), *No. 2, pp. 83–87, figs. 2*).—Experiments conducted by the Bureau of Science of Manila showed that if clinker is ground in a small laboratory mill, its average time of set is independent of the amount of calcium sulphate added. When ground in the regular way at the plant it must have a sulphuric anhydrid content of 1.8 per cent to insure a normal set. The effects of exposure to air and of additions of hydrated lime were found to be independent of the sulphuric anhydrid content. Soundness and normal consistency were independent of the sulphuric anhydrid content, except that the latter increased with the amount of hydrated lime present.

Pressing out mix water adds to cement mortar strength, C. T. WISKOCIL (*Engin. News-Rec., 83* (*1919*), *No. 3, pp. 130–132, figs. 3*).—Tests made with special apparatus at the University of California on the effect of expressing the water from cement mortar ranging from neat to 1:5 mix and a constant 1:4 mix on strength are reported.

It was found that using pressures up to 30,000 lbs. per square inch gave very high compressive values. "The greater percentage increase in the strength of the lean mixes was caused by the higher relative water content of the mortar as based on the amount of cement used. The stiffer consistency of the richer mixes produced relatively greater strengths in the controls and lower strengths in the pressure specimens. . . .

"This explanation was verified by making a special batch of neat cement mortar with 37.25 per cent water by weight of cement. Pressure specimens made from this mixture were 6¾ times stronger than the controls. The molding pressure, 30,000 lbs. per square inch, thus produced an increase of 575 per cent in the compressive strength. The average strength of the pressure specimens made from mortar mixed with 25 per cent water was 14,230 lbs. per square inch. Pressure specimens made from the wetter mortar averaged 17,080 lbs. per square inch. . . .

"Increasing the amount of water expressed has a decided effect on the strength, especially at the lower pressure. At 10,000 lbs. per square inch the percentage increase in strength is about 570 per cent, while the maximum pressure (30,000 lbs. per square inch) raises this percentage increase to 810."

Effect of vibration, jigging, and pressure on concrete, D. A. ABRAMS (*Engin. and Contract., 52* (*1919*), *No. 13, pp. 352–354, figs. 7*).—The results of an experimental study conducted at Lewis Institute on the effect of vibration and pressure on the strength and other properties of fresh concrete are reported. The test series included 600 compression tests of 6 by 12 in. concrete cylinders at the age of 28 days.

It was found that varying the number of strokes from 12 to 50 on each 4-in. layer in the standard method of hand-puddling with a ⅝-in. bar had little influence on the compressive strength of ordinary plastic concrete. In general, the tamping methods used gave lower strengths than hand-puddling. A tamper of large diameter for a given weight was less effective than one of smaller diameter. Increasing the thickness of the layer from 4 to 6 in. caused a falling off in strength of about 12 per cent for tamped concrete. Tamping or puddling the first 4-in. layer only, caused a falling off in strength of 10 to 13 per cent. Striking the metal form with a steel bar after the completion of molding by the standard method had no effect on the strength of concrete. The "standard" method of hand-puddling, using 25 strokes with a ⅝-in. steel bar for each 4-in. layer of concrete in a 6 by 12 in. cylinder, is recommended for laboratory tests of concrete.

Vibration of the specimen after molding by means of an electric hammer running at 1,000 r. p. m. had little influence on the strength of the puddled concrete up to a period of about 30 seconds. If continued, there was a steady falling off in strength; after 45 to 60 seconds the strength was only 90 per cent of that produced by the standard method of puddling.

In general, jigging in any manner with the apparatus used reduced the compressive strength of the concrete regardless of the height of drop, rate, or duration of treatment. Exceptions were found in the dry mixes and those made of aggregates of the smaller sizes. There was little difference in the effect of jigging due to the quantity of cement used. In the very dry mixes the strength, due to jigging 20 seconds, was increased about 25 per cent. The wetter mixes (relative consistency 1.1 to 1.25) were reduced in strength 3 to 6 per cent by jigging.

Pebbles and crushed limestone as coarse aggregate gave essentially the same results in the jigging tests. The concretes for finer aggregates showed a material increase in strength with jigging in both 1:5 and 1:3 mixes. For aggregate coarser than about ⅜ in., jigging reduced the strength from 3 to 10 per cent. The grading of the aggregates (for a given maximum size) had little influence on the effect of jigging.

The greater the drop the greater the reduction in strength for 1:5 concrete. For a drop of ½ in. the strength was reduced 12 per cent. The faster the rate of jigging the lower the strength of 1:5 concrete. Using 1½-in. aggregate at 150 r. p. m. the strength was reduced about 13 per cent. The strength of 1:5 concrete fell off rapidly with the duration of jigging. After 2 to 3 minutes jigging the strength was reduced about 20 per cent as compared with the standard method of hand-puddling. Allowing the concrete to stand for a period of time before jigging increased the strength to a slight extent. The maximum increase was found at 2 to 4 hours. The application of a pressure of 1 lb. per square inch during the jigging process (equivalent to a head of 1 ft. of fresh concrete) gave the same strength as standard hand-puddling. Molding the cylinders by the standard method on the jigging table while it was in motion gave the same strength as standard hand-puddling without jigging.

The compressive strength of concrete was increased by pressure applied immediately after molding. For a pressure of 200 to 500 lbs. per square inch the increase was 20 to 35 per cent. The duration of pressure as between 15 minutes and 16 hours produced no difference in strength. There was a steady reduction in the water-ratio of the concrete with the application of pressure. The application of pressure increased the strength of concrete in accordance with the quantity of mixing water expelled. The tests of concrete subjected to pressure showed the usual relation between compressive strength and water-ratio.

Tests of eighteen concrete columns reinforced with cast-iron, J. Tucker, Jr. and J. G. Bragg (*U. S. Dept. Com., Bur. Standards Technol. Paper 122* (*1919*), *pp. 38, pls. 8, figs. 13*).—A description and discussion of tests of 18 reinforced concrete columns to determine the suitability of cast iron as a reinforcing material when used with the usual spiral hoop and vertical steel rod reinforcing is given. The cast-iron reinforcing consisted in most cases of cast-iron cylinders of different diameters and wall thicknesses, which were placed in the center of the column. In two cases cast-iron I-beams with long oblong holes in the web were used for reinforcing.

The behavior of these columns tested to failure was similar to that of ordinary concrete columns reinforced with spiral and longitudinal steel rods. The concrete shell began to fail at the same strain at which cylinders of plain concrete failed, an average of about 0.00145 in. per inch. This type of column gave ample evidence of approaching failure. The economical limit of cast-iron reinforcement to be used is given by the formula

Per cent cast iron$=\frac{100fe}{fi+fe-fv}$, or 21 per cent using the values determined in this test. fe=maximum stress withstood by the hooped concrete: For 1 per cent spiral reinforcing and 1:1:2 concrete this value appeared to be 5,300 lbs., or 33 per cent increase above the unrestrained strength of concrete. fi=maximum stress withstood by cast iron: A fair value for this would be 60,000 lbs. fv=stress in the cast-iron reinforcement when the column is sustaining maximum load or about 40,000 lbs.

Eccentricity and variation in pitch of the spiral and variation in depth of the longitudinal steel rods of the column apparently did not affect its strength. The maximum strength of the columns was not quite equal to the strength of the cast-iron reinforcement tested independently, plus the strength of a spiral reinforced column. The columns commenced to scale at from 58.5 to 77.5 per cent of maximum load as against from 77.2 to 94.7 per cent for plain spiral reinforced columns. The average maximum total load withstood by the various cast-iron reinforced columns was 81.5 per cent greater than that withstood by plain spiral columns of the same length. From nine columns of the same cross-section and lengths of from 6 to 14 ft. with 12.5 per cent cast iron (that is, of total area of cast-iron, rods, and concrete within spiral), the formula $\frac{P}{A}=12{,}500-20\,l$ is derived. In this, P = mean stress upon total area of column within spiral, A = total area as above, and l = length of column in inches.

Filling the hollow cast-iron core of the columns apparently added approximatey 6,500 lbs. for each square inch of cross section of the concrete thus filled in. It also increased by 20 per cent the load withstood at the first signs of failure.

Varying the radius of gyration of the cast-iron-tube reinforcement, the cross section of the cast iron remaining constant and the tube hollow, appeared to have the following results: (1) A 10 per cent greater load in the columns with the smaller diameter pipe before the first spalling or indication of failure, (2) the same ultimate strength and the same total load, and (3) the same strain curve for all columns. The splicing of the columns evidently made the spliced sections stronger than the rest of the column section. The column did not buckle at these points. The columns were stiffer than any of the other columns, and failed at the average maximum of the other columns of the same length. The columns with I-sections were apparently exactly similar in their action to those of the same percentage of cast iron in the form of tubes and did not show any signs of bending until after the maximum load had been withstood.

Burnt earth concrete, with iron and wood reinforcement, L. P. Hodge (*Engineering* [*London*], *108* (*1919*), *No. 2801, pp. 302, 303, figs. 11*).—Experiments and practice are reported from which the conclusions are drawn that well burnt earth can be safely substituted for stone in concrete when the cost of stone is prohibitive, and that hardwood can be substituted for iron or steel reinforcement with advantage in fairly large sections when the cost of iron is prohibitive. In sections of small depth, however, the cost of converting the wood into thin strips and the difficulty of so placing them as to get sufficient tension and sufficient surface protection outweigh the advantage.

The most suitable wood with reference to uniformity and ultimate resistance to tension was found to be greenheart.

Wind motors: Their possibilities and limitations, F. C. Poulton (*Jour. Roy. Soc. Arts, 67 (1919), No. 3480, pp. 590–594; also in Sci. Amer. Sup., 88 (1919), No. 2286, pp. 286, 287*).—This article deals with the possibilities and limitations of wind motors for supplying power for corn grinding, pumping, general farm-machinery operation, workshops, and generation of electricity for light and power, with special reference to conditions in the United Kingdom.

Prime mover of high efficiency, F. E. D. Acland (*Sci. Amer. Sup., 88 (1919), Nos. 2282, pp. 204, 205; 2283, pp. 218, 219, 232, figs. 6*).—A description is given of the general features of the so-called Still engine, which is a new type of internal-combustion engine utilizing the heat of radiation and exhaust for the generation of steam, which is used for increasing the general efficiency of the engine. The principles of the engine and the results of tests are also summarized.

Gas engine troubles, V. V. Detwiler (*Bien. Rpt. Kans. State Bd. Agr., 21 (1917–18), pp. 103–110, figs. 4*).—The author briefly outlines farm gas engine troubles and remedies therefor.

Kerosene as a fuel in high-speed engines, L. F. Seaton (*Mech. Engin. [New York], 41 (1919), No. 11, pp. 881, 882, figs. 3*).—A series of tests on a high-speed, heavy-duty type of engine, using kerosene as fuel, are reported.

A series of tests was first run with various temperatures in the vaporizer, air entering the carburetor at a constant temperature. The temperature of the intake air was maintained at 115° F., and the temperature around the vaporizer was increased from an initial 150° by 100° increments until a temperature of 650° was maintained on the bypass pyrometer. The loads carried under this condition were approximately 5, 10, 15, and 20 h. p. Tests were also made increasing the temperature of the intake air by increments of 10°.

It was found that the thermal efficiency of the engine was practically constant throughout all heat changes made. At low heats the motor would not idle down below 800 or 900 r. p. m. At the exceptionally high temperatures of the ingoing down gases (about 375°) the engine could be idled down to 150 r. p. m., would pick up almost as well as when burning gasoline, and could be started on kerosene. The only advantage in heating the ingoing air and gas was that it made the motor more flexible.

"It is the belief . . . that a motor designed as follows would handle kerosene at all loads successfully: The pistol displacement should be greater per horsepower than that commonly used, a higher compression pressure should be obtained, the intake passages should be large and short, and the intake gas should be heated to a temperature considerably above the boiling point of kerosene. This probably would be done with the exhaust gases, necessitating an automatic temperature control at all loads."

Weighing liquid fuel in engine test, J. S. A. Johnson (*Power, 50 (1919), No. 18, p. 656, fig. 1*).—In connection with a test of internal-combustion engines at the Virginia Polytechnic Institute, it was found that in the weighing of liquid fuel the actual weight of fuel used must be calculated by subtracting from the difference recorded by the scales between the weights at the beginning and end of the test, the weight of a volume of the liquid equal to the volume of the dimensions of the suction pipe between the levels of the liquid at the beginning and end of the test.

Researches on the resistance to wear of parts of agricultural machines, M. RINGELMANN (*Compt. Rend. Acad. Sci.* [*Paris*], *169* (*1919*), *No. 18, pp. 807–809*).—This is a brief outline of methods proposed by the Society for the Encouragement of National Industry of France for the testing of the wear of the metal parts employed in the construction of agricultural machines under varying conditions of use, the purpose being to develop questions relating to durability of the metal, heat treatment, etc.

Agricultural tractors, M. DE MAGALHÃES (*Escola Agr. "Luiz de Queiroz," Piracicaba, Brazil, Ser. Engen. Rural, Bol. 3* (*1919*), *pp. 13, figs. 9*).—This is a brief review of experimental work with tractors as conducted by the Texas Experiment Station, and a discussion thereof to show how the results may be adapted to conditions in Brazil.

American tractors in the English tests, J. E. MARTIN (*Farm Machinery, No. 1464–1465* (*1919*), *pp. 13, 14, 58, 60, 62, 64, figs. 3*).—This is a general report on the international field demonstration held at Lincoln, England, from an American viewpoint. Comparisons are drawn between this demonstration and similar events that have been held in America, and the opinion of the British farmer regarding modern methods is analyzed.

The soils on which the plowing demonstrations were conducted furnished two extremes, one being a lowland heavy clay and the other a light upland loam. On the lowland soil the resistance to traction offered by plowing varied from 592 lbs. with a 9-in. bottom at a 5½-in. depth to 810 lbs. with a 9-in. bottom at a 6-in. depth. On the light loam soil the resistance of plowing varied between 392 and 565 lbs. at the same width and depth of cut.

In the hauling trial each contesting tractor was required to draw a trailer wagon up a hill, loaded with pig-iron bars, until the limit of its power or its traction was reached. It was found that rubber tires or even smooth drive wheels had a very great advantage over ordinary cleat or spud drive wheels in this test.

The Lincoln tractor trials, T. CLOSE, B. J. OWEN, and H. G. RICHARDSON (*Jour. Bd. Agr.* [*London*], *26* (*1919*), *No. 7, pp. 686–690*).—This is a preliminary report of a large tractor test conducted in England.

A noteworthy feature of the trials was the evidence that considerable attention is being paid to reduction in weight and to rendering vital parts of the machinery more accessible. Little difference was found between the comparative values of high-speed and low-speed machines. In comparing wheels with caterpillar tracks it was found that the advantages of the latter do not lie in their distinguishing feature. All the plows operated in the test turned narrow furrows and were fitted with general-purpose breasts. Another feature of the plowing was the general adoption of self-lift plows. Riding plows were in use with a few of the heavier tractors, but no advantage was evident. The majority of the tractors gave ample evidence of their suitability for providing power for thrashing.

Tests of work with tractors at Bourges, 1919, E. RABATÉ (*Prog. Agr. et Vitic.* [*Ed. l'Est-Centre*], *40* (*1919*), *No. 42, pp. 370–375*).—Cultivation tests using 15 different tractors and motor plows of French, British, and American manufacture, and tests of plows, pulverizers, and other cultivating implements are briefly reported. The work was done on very tough, dry, siliceous clay soil, plowing to an average depth of about 15 cm. (5.9 in.).

It was found that soil deep plowed with a tractor was better pulverized and not so dry as other soils. The work was, in general, done with greater ease, and the soil was more completely inverted and in a condition to make better use of atmospheric moisture. The soil on which the tests were conducted had been deep plowed the previous year, and it was noted that it had retained more water and was easier to plow than soil which had been shallow plowed. The tests indicated the advisability of having an ample factor of safety in the rated power of the tractor motor, in view of the sudden and large overloads to which this type of soil subjected the tractor during plowing. It was found that the tractive effort increased in this soil and under the conditions of the test with the square of the depth of the plowing.

The detailed data of the tests are reported in tables.

Farming by motor (*London: Temple Press, Ltd., pp. 95, figs. 60*).—This pamphlet gives considerable popular information regarding farm tractors and motor plowing from the English viewpoint. It includes illustrated examples of the work that can be done with motor tractors, and information for guidance in the selection of machinery for motor tillage.

Mechanical cultivation and its use on a small scale on small farms, HOTTENGER (*Cong. Gén. Génie Civ. Sess. Natl., 1918, Trav. Préparatoires, Sect. VII, Génie Rural et Indus. Agr., pp. 179–192*).—This is mainly an economic consideration of the use of tractors, motor plows, and other mechanically propelled cultivating apparatus on small farms in France.

Actual motor cultivation, P. LECLER (*La Motoculture Actuelle. Paris: Soc. Agr. France, pp. 28, figs. 23*).—This pamphlet gives an analysis of tractors, tractor plows, and cultivating apparatus, with particular reference to the construction of their characteristic working parts and their mechanical operation. Tractors are divided into four categories, as (1) tractors, properly speaking, which draw cultivating implements and can be detached therefrom, (2) automobile plows, (3) cable tractors, which draw cultivating apparatus by means of cables, and (4) so-called haulers, which haul themselves and cultivating apparatus by means of anchored cables. The general construction of these types is described, with particular reference to the number, distribution, and operation of the wheels. A summary of recent experiments is also given, most of the data from which have been noted from other sources. An appendix is included which gives graphic data on factors influencing the mechanical operation of the tractor, including such matters as volume of soil removed per horsepower-hour, increase of consumption of fuel per horse-power with decreasing charge, relation between the volume and weight of fuel consumption, consumption of fuel per acre plowed at different depths, and fuel consumption in gallons per acre under different conditions.

The week of motor cultivation in autumn, G. COUPAN (*Vie Agr. et Rurale, 9 (1919), No. 45, pp. 321–330, figs. 12*).—This is a report on tractors, tractor plows, and other motor-propelled cultivation apparatus as tested in France during the past fall. These included a number of tractors of American manufacture. No specific test results are given other than general results of performance.

Plows for mechanical cultivation, G. DUVAL (*Vie Agr. et Rurale, 9 (1919), No. 45, pp. 331–334, figs. 5*).—This article deals with the mechanical details of French and American plows for use with tractors.

The economic limit to motor truck weights, R. C. BARNETT (*Engin. and Contract., 51 (1919), No. 1, pp. 6, 7; 52 (1919), No. 14, pp. 374–380, figs. 6*).—An extensive mathematical analysis is given of annual cost of roadbed, annual cost of motive power, and annual cost of vehicles, as functions of total annual cost of motor-truck transportation, with a view to determining minimum cost per ton-mile as a basis for road and truck selection and design.

The first general conclusion is drawn that an increase in the size and weight of a motor truck tends to increase the annual cost of pavement and to decrease the annual cost of power and of the vehicle. The cost per ton-mile, which is to be made a minimum, is expressed as the total annual cost indicated above divided by the annual ton-mileage. The total annual cost is expressed in terms of truck capacity and speed in miles per hour by the following formula:

$$C_a=27368K^{2/3}+48.6K^{1/8}S^2+\frac{2,752,000}{SK^{1/3}}+\frac{8,880,000}{SK}$$
$$+\frac{122,400}{K^{1/4}}(.0447K^{3/8}S^2+77)\frac{2,000}{K^{1/4}}$$

in which C_a=the total annual cost or the sum of total roadbed cost and total operating cost, K = the capacity of the truck, and S = the speed in miles per hour.

Elevators and transporters of hay, M. RINGELMANN (*Jour. Agr. Prat., n. ser., 32 (1919), No. 18, pp. 368–371, figs. 8*).—This article gives a mechanical analysis of several different types of hay-unloading apparatus, including rope slings, forks, and single and double hooks, as used in France.

On the design of railway wagons for the carriage of perishable foods, A. R. T. WOODS ET AL. (*Dept. Sci. and Indus. Research* [*Gt. Brit.*], *Spec. Rpt. 1 (1919), pp. 8*).—This report deals with the features and design of refrigerator and fruit cars from the English viewpoint.

Tests of two refrigerator cars were made in which the cars were charged with ice and salt and allowed to stand on a siding. Observations of the atmospheric temperatures and the temperatures at the top and bottom, taken every 2 hours over a period of 48 hours, showed that the temperatures in each of the cars were very nearly the same during the test. It was noticed throughout that the upper thermometers showed nearly constantly temperatures, which were from 5 to 7° F. higher than those at the bottom. It was also found that after the first 24 hours a rise which occurred in the outside atmospheric temperature was accompanied by an almost similar rise in the temperature inside the car. During the experiment the atmospheric temperature ranged from 87 to 57.5°, with an average of 65.25°. The lowest average temperature reached in the car was 46°, the outside temperature at the time being 62°. At the termination of the experiment the mean temperature in the car was 56°, the mean atmospheric temperature being then 74.25°. It was noted that although the car temperature had increased by 10° from the minimum obtained, there was still a considerable quantity of ice remaining in the tanks at the conclusion of the tests.

It is generally concluded that "(1) the insulation of none of the cars is as effective as is desirable, and improvement can be made both in existing cars and especially in cars which have to be constructed in future, (2) the deficiency in the air-tightness of the cars is a serious matter, especially as regards the fitting of the doors. This should be remedied in the existing cars, and proper provision for air-tightness should be made in all those which will be constructed in future, (3) the provision of ice-tanks in the cars may be considered large enough, but the practice of icing them is altogether inefficient, and steps should be taken to insure improvements on these points."

The literature of refrigeration, G. C. HODSDON and C. H. LEES (*Dept. Sci. and Indus. Research* [*Gt. Brit.*] *Spec. Rpt. 2 (1919), pp. 8*).—A list of 170 references to English, American, French, Italian, and German literature on refrigeration is given.

Buildings for farm animals, M. RINGELMANN (*Logements des Animaux Principes Généraux. Paris: Libr. Agr. Maison Rustique, 1918, pp. 160, figs. 199*).—This books deals first with the general principles involved in the design and construction of living quarters for animals, including barns, sheep folds, stables, hog pens and houses, poultry houses, and dog kennels as used in France. The second part of the book deals more specifically with the design of stalls and stables, taking into consideration factors relating to size and type of animal and general characteristics of the animal; also questions relating to lots and pastures with their necessary equipment are discussed. All important points of design and construction are illustrated. A final section includes illustrations of sample buildings and structures.

The storing of roots, H. A. CRAIG and S. G. CARLYLE (*Edmonton, Canada: Govt., pp. 10, figs. 9*).—Brief instructions for the planning and construction of root storage cellars are given, together with sample drawings.

Limiting the fuel for domestic heating, K. MEIER (*Jour. Amer. Soc. Heating and Ventilating Engin., 25 (1919), No. 1, pp. 43–48*).—This is a comparison of methods and efficiency of domestic heating in Switzerland and in this country.

From records and personal experience the author states that the legitimate normal consumption of coal for residences in Switzerland averages about ⅓ ton per 1,000 cu. ft. of actually heated space, or ⅔ ton per room of 2,000-cu.-ft. capacity. In comparing these conditions with conditions in the United States, he is of the opinion that the same normal consumption of coal should in general prevail in this country, but gives data to show that the consumption here is considerably greater. He attributes this waste of fuel in house heating to building construction, ventilation, differences of temperature actually maintained, types of heating system used, and the low efficiency of boilers and furnaces. With reference to temperature actually maintained, it is shown that for the same temperature difference and nearly equal fuel consumption it should be possible to maintain higher indoor temperatures in climates similar to that in New York than in Switzerland.

How to figure coil sizes for hot water services, M. W. EHRLICH (*Dom. Engin., 90 (1920), No. 3, pp. 122–124, figs. 5*).—A simple graphic method is given for finding the number of feet of pipe required for heating water to any temperature by the use of live or exhaust steam, with particular reference to domestic practice.

A test of the conductivity of window shades, J. R. ALLEN (*Jour. Amer. Soc. Heating and Ventilating Engin., 25 (1919), No. 1, pp. 65, 66*).—Tests conducted for the purpose of determining the relative amounts of heat transmission through a single-strength glass window, close fitting with stops on both sides, first without window shades and second with window shades pulled down in front of the window, are reported.

It was found that the saving in heat transmitted by the use of the single inside curtain was 19.2 per cent, by the outside curtain 28.7 per cent, and by both curtains 42.7 per cent. The marked difference in heat transmission between the tests of the inner curtain and the outer curtain was without doubt due to the fact that the inner curtain did not fit its opening tightly. This allowed currents of warm air to enter at the top and, being cooled between the curtain and the window, to fall and go out through the clearances at the sides and bottom. The outer curtain fitted over the smooth sides of the box about 1.5 in. and permitted very little movement of air between it and the window.

Rural home sanitation, V. M. EHLERS and L. G. LENERT (*Tex. State Bd. Health Pub. No. 2* (*1919*), *pp. 39, figs. 36*).—This is a popular bulletin dealing with all phases of rural sanitation, including location of buildings, water supply, sewage disposal, sanitary building construction, and the destruction of flies, mosquitoes, and vermin.

Treatment of canning-plant wastes in Wisconsin, E. J. TULLY (*Engin. News-Rec.*, *83* (*1919*), *No. 21, pp. 1017, 1018, figs. 3*).—This is a general statement of plans for the treatment of plant washings, silage juices, and combined wastes by the Wisconsin State Board of Health.

Briefly stated, treatment of these wastes involves reduction of the concentration of the organic matter, in suspension and in solution, to conform to local sanitary requirements. The plan indicated to accomplish this end includes diversion of all cooling water around the treatment system to be used to dilute the effluent; coarse screening of the waste products prior to discharge into the system, if it is desired to recover peas, etc., to be used for cattle-feeding purposes; discharge of domestic sewage into public sewer systems, when such facilities are afforded; conveying pea, corn, and plant washings and silage juice effluent, and sewage if necessary, to a common point, and subjecting wastes to treatment in a combination unit comprising a sedimentation or retention unit of three sections and a crushed stone gravity or contact filter, depending on topographical conditions; and preliminary treatment of silage juice, using lime or soda-ash to neutralize partly the acidity and reduce the organic concentration, and subjection of the chemically treated liquor to sedimentation, coke contact, or gravity straining and gravel-sand filtration, depending on the degree of treatment required prior to the discharge of the effluent into the unit used to treat the washings.

Use of paint on the farm, H. H. KING (*Bien. Rpt. Kans. State Bd. Agr.*, *21* (*1917–18*), *pp. 126–135, figs. 6*).—Information on the proper use of paint on Kansas farms is given, which is based largely on the results of experiments conducted at the Kansas Agricultural College.

In tests of the drying tendencies of sunflower, soy bean, and menhaden fish oils, it was found that when mixed with linseed oil in half-and-half proportions these oils did not show any inferior qualities to linseed oil alone, and indicated the possibility of their partial substitution for linseed oil. In experiments on the use of lead and zinc as pigments, it was found that mixtures containing both of these pigments possessed better covering and lasting qualities than either alone. It has also been found that varying proportions of so-called reinforcing or inert pigments in ready mixed paints may be employed with no noticeably serious effects. It is noted that for Kansas conditions a southern exposure destroys paints much more rapidly than a northern exposure. Experiments with a paint tinted yellow with a very small quantity of chrome yellow showed the effect of this color in lengthening the life of the paint, and in most cases the panels painted with the tinted paints stood up better than those painted with a white paint.

Electricity on Kansas farms, C. M. HARGER (*Bien. Rpt. Kans. State Bd. Agr.*, *21* (*1917–18*), *pp. 95–102, figs. 3*).—This article describes briefly a rural electrical system in Kansas, reaching into 10 counties, and utilizing transmission lines supplied by two central stations. It is noted that the first cost of installation to the average farmer is about $380, which includes also the first year's expense for power up to 5-h. p. connected load. The annual minimum rate for power is $30 a year or $2.50 per month.

The development of the application of electricity to agriculture, P. LECLER (*Cong. Gén. Génie Civ.*, *Sess. Natl.*, *1918*, *Trav. Préparatoires*, *Sect.*

VII, Génie Rural et Indus. Agr., pp. 82–139).—This is a rather extensive discussion of the important factors in the promotion of the use of electricity in the agricultural districts of France, with particular reference to matters interesting the farmer, the producer of electricity, the distributor of electrical current, and the manufacturer of electrical apparatus.

RURAL ECONOMICS.

Royal Commission of Agriculture.—Interim report of His Majesty's commissioners appointed to inquire into the economic prospects of the agricultural industry in Great Britain, W. B. PEAT ET AL. (*London: Govt., 1919, pp. 21*).—It is recommended in this report by the Royal Commission of Agriculture that (1) minimum prices for wheat, barley, and oats grown in Great Britain be guarantied by the State on the same principle and conditions as are laid down in part 1 of the Corn Production Act, 1917, the producer being allowed unrestricted market for his produce, but the State retaining the right to control prices in case of national emergency, (2) that barley should be dealt with in the same manner as wheat under section 1 of the Corn Production Act, (3) that for the grain crops of 1920 and subsequent years the guaranties be calculated on a sliding scale, based on average bare costs of production of the preceding year, (4) that the guaranties be continued until Parliament otherwise decides, not less than four years' notice of withdrawal being required, (5) that the boards of agriculture or county committees be empowered to take action against any landowner or farmer guilty of neglectful cultivation, (6) and that a certificate be required to the effect that the holding has been well cultivated, and that either one-eighth part of the holding or one-fourth part of the arable land is under cereal crop.

The minority report recommends that farmers be left free to cultivate their land as they deem best; that the boards of agriculture organize a system of distribution of information relating to agriculture; and that so long as prices of cereals are controlled by the Government, the farmers be paid prices not less than those at which the commodities can be imported. In making reservations to all but the first of the recommendations of the majority report, H. S. Cautley contends that average bare costs of production are impossible of determination.

Royal Commission of Agriculture.—Minutes of evidence (*London: Govt., 1919, vols. 1, pp. 189, App., pp. 20+V; 2, pp. 128, App., pp. 32+III; 3, pp. 119, App., pp. 103+III; 4, pp. 92, App., pp. 41+III; Minutes Nov. 4–5, pp. 539–589*).—This gives the evidence heard at intervals between August 5 and November 5, 1919, by the commission appointed "to inquire into the economic prospects of the agricultural industry in Great Britain, with special reference to the adjustment of a balance between the prices of agricultural commodities, the costs of production, the remuneration of labor, and hours of employment."

The German agricultural problem during and after the war, DE GUICHEN (*Jour. Économistes* [*Paris*], *1919, Nov., pp. 248–261*).—This sets forth German difficulties with regard to food supply during the war, the concern of that nation in controlling the grain-growing regions of eastern Europe, and its purchases of Roumanian grain, and discusses the probability of emigration by the German agricultural population.

Government regulation and vegetable growing, A. BOVENSCHEN (*Kriegswirtschaft und Gemüsebau. Berlin: Deutscher Schriftenverlag, 1918, pp. 36*).—A defense is made of the German food administration against charges of being socialistic, and a high protective tariff for German agricultural products after the war is urged.

Some directions in which Victorian agriculture may be developed, A. E. V. Richardson (*Jour. Dept. Agr. Victoria, 17* (*1919*), *No. 11, pp. 641–650*).—A further development of the wheat, wool, dairying, and meat industries and of diversified agriculture and systems of marketing is urged.

The farmers' platform.—A new national policy for Canada as adopted by the Canadian Council of Agriculture at Winnipeg, on November 29, 1918 ([*Winnipeg*]*: Canad. Council Agr., pp. 8*).—The official draft of the revised and extended platform adopted by the Canadian Council of Agriculture in November, 1918, includes a reduction of the customs tariff leading to complete free trade with Great Britain in five years, direct taxation, and other planks relating to demobilization, land settlement, public ownership of systems of communication and transportation, and minor reforms.

The Argentine grain grower's grievances, G. Holm ([*Buenos Aires: Author*], *1919, pp. 228, pl. 1*).—The methods of grain marketing existing at present in Argentina are criticized from the standpoint of profits to the farmer and waste due to incorrect grading and storing. Arguments are presented in favor of State intervention in the construction of elevators and establishing uniform grades as the solution of difficulties of the grain farmers. In this connection, also such questions of rural credit as mortgages, harvesting loans, and warrants on grain stored, and of future grain trade possibilities are discussed.

Where opportunity knocks twice, F. Crissey (*Chicago: Reilly & Britton Co.,* [*1914*], *pp. 207, pls. 63*).—Methods of cultivation and marketing fruit and truck crops, as practiced by foreigners and a few native American small farmers in California, are described.

The determination of farm costs, J. Keane (*Jour. Bd. Agr.* [*London*], *26* (*1919*), *No. 9, pp. 891–906*).—Actual farm accounts kept from 1914 to 1918 on the author's home farm, Waterford, Ireland, along lines suggested by an investigation by Orwin previously noted (E. S. R., 40, p. 192), are given. Under the system noted here no charges are made for interest on capital because it is regarded as a charge on profits rather than on production, nor are the services and expenses of the proprietor charged to farm costs since these are variable quantities. Total pasture charges are distributed at the end of the accounting year in proportion to the capital value of the various classes of stock. Overhead charges are included in the cost of crops or pasture.

The net income on certain crops, L. Malpeaux (*Vie Agr. et Rurale, 9* (*1920*), *No. 2, pp. 25–28*).—Comparative estimates, reporting the relative cost of production of wheat, oats, sugar beets, fodder beets, and potatoes in France before the war and in 1919, are given and discussed to show the complexity of determining accurate net income.

Ouyen farm competition, H. A. Mullett (*Jour. Dept. Agr. Victoria, 17* (*1919*), *No. 12, pp. 705–721, figs. 12*).—This article describes details of farm management found on a farm in the Mallee Settlement of northwest Victoria receiving the prize award in a farm competition held by a local agricultural society.

Profit and loss sharing on the farm, J. Wyllie (*Jour. Bd. Agr.* [*London*], *26* (*1919*), *No. 9, pp. 910–913*).—This outline of a profit-sharing scheme, intended primarily for tenant farmers and their employees, was awarded the prize offered recently for the best scheme submitted through certain British agricultural papers.

Housing of the agricultural laborer, J. C. Thresh (*London: Rural Housing and Sanit. Assoc., 1919, pp.* [*II*]*+81, pl. 1*).—This pamphlet treats the subject from the point of view of public health administration in small districts, with particular reference to the county of Essex, England, and emphasizes the need for new cottages. The principal defects of housing facilities are discussed, and details are given of the sanitary condition of rural cottages in several typical districts of the county.

Jewish colonization in Palestine.—Methods, plans, and capital, J. Oettinger (*[The Hague]: Head Off., Jewish Natl. Fund, pp. 110+[II], figs. 3*).—This briefly describes the agricultural colonization of Palestine which has taken place under philanthropic organizations, individual private initiative, organized settlement companies, cooperative methods, and national programs, and notes colonization methods current in European countries. It discusses more in detail farming plans and estimates for the foundation and working capital required, annual outlay, and gross and net income on colonists' holdings of different sizes and types. Estimates are also given of the capital necessary for establishing and maintaining colonies of 100 families and more.

Cooperation in Geneva and in Switzerland, J. Renaud (*La Coopération à Genève et en Suisse. Geneva: Soc. Coop. Suisse Consommation, 1918, pp. VII+158+[I], pls. 12, figs. 3*).—The author traces the workings of the Swiss Cooperative Consumers' Society of Geneva through the 50 years of its existence and the rôle of cooperation in Switzerland during and since the war.

Report on the working of cooperative societies in Bihar and Orissa for the year 1918–19 (*Rpt. Work. Coop. Socs. Bihar and Orissa, 1918–19, pp. [II]+42+8+2, pl. 1*).—This report continues information previously noted (E. S. R., 40, p. 896).

Farmers' Market Bulletin (*North Carolina Sta., Farmers' Market Bul., 6 (1919), No. 31, pp. 19, fig. 1*).—This number contains the usual list of products which farmers have for sale, together with brief live-stock notes by C. S. Jones.

Monthly Crop Reporter (*U. S. Dept. Agr., Mo. Crop Rptr., 6 (1920), No. 1, pp. 8*).—The usual monthly estimates of acreage and production, and brief articles, notes, and tabular data as to stocks, the farm and market prices, and marketing of important agricultural products are given. Official reports of area and production of important world crops in 1917, 1918, and 1919 are summarized.

[Annual agricultural statistics of France, 1917] (*Statis. Agr. Ann. [Paris], 1917, pp. 219–414*).—These pages continue information previously noted (E. S. R., 40, p. 793).

[Agricultural statistics of Algeria for 1913 and 1914] (*Statis. Gén. Algérie, 1913, pp. 233–280; 1914, pp. 233–280*).—Statistics are continued from those previously noted (E. S. R., 33, p. 395).

AGRICULTURAL EDUCATION.

The Federal executive departments as sources of information for libraries, E. Guerrier (*U. S. Bur. Ed. Bul. 74 (1919), pp. 204*).—This bulletin contains brief statements of the functions and, in some instances, of the accomplishments of the various offices of the Federal executive departments which have printed matter of interest to libraries.

The next organization step in southern agriculture, S. G. Rubinow (*School and Soc., 10 (1919), No. 252, pp. 479–485*).—This is a review of the development of agricultural extension work begun in 1904 as farm demonstration work. The method of demonstration work having passed from the stage of individual instruction to that of group or organized instruction, the author holds that the next step in southern agriculture must be represented by county organizations, either in the form of boards of agriculture, advisory councils, or agricultural bureaus. He offers suggestions with reference to the organization of such county boards of agriculture, points out their advantages, and states concretely what they should accomplish.

Agricultural education (*Natl. Soc. Vocat. Ed. Bul. 31* (*1919*), *pp. 29*).—This bulletin contains the following three articles relating to agricultural education, and the report of the committee on resolutions of the agricultural education section of the National Society for Vocational Education.

Purpose and Methods of Supervision in a State System of Agricultural Education, Z. M. Smith, (pp. 7–12).—The author briefly outlines some of the fundamental principles underlying the problems of supervision of vocational agricultural education.

Two Important Current Problems of Agricultural Education, D. Snedden (pp. 13–19).—In the author's estimation the problem of finding a type of school that should primarily give basic, instead of extension, vocational education for specific farming callings, that would be adapted primarily to boys of secondary school age, that would be inexpensive, that would not be chiefly a feeder to the agricultural college, etc., was largely solved when the home project type of training and instruction was evolved. Two problems further extending and defining the home project method are suggested.

In the first of these the author contends that "vocational education can never be really effective unless administered in the light of reasonably probable assurance as to what will be the career of the person trained during (*a*) the first five years, and (*b*) the second five years, etc., after the close of such training. . . . Findings, under this problem will vary from community to community, perhaps from decade to decade, as social conditions change. Expected results will not always follow in the individual cases, but they must for model numbers, otherwise our findings are unscientific and misleading, and our procedures based on them, wasteful, perhaps valueless, conceivably harmful."

The second problem deals with the general problem of defining optimum quantitative measures for projects which the author considers now one of the most important in sound vocational agricultural education. He has come to the conclusion that projects now prevailingly employed are too small. As a means of initiating discussion he proposes standards for boys free to devote their full time to getting a vocational agricultural education. The difficulties sometimes claimed in standardizing improvement projects are considered only those inherent in bookkeeping and proper inventorying.

Present and Future Relations of Vocational Agricultural Education and Agricultural Extension, W. G. Hummel (pp. 20–27).—The author discusses the nature and purposes of the Smith-Lever and Smith-Hughes Acts, and briefly defines the relationships under the two acts in accordance with an agreement approved February 15, 1918, by a joint committee of the U. S. Department of Agriculture and the Federal Board for Vocational Education.

[Report of] committee on relationships of vocational schools to the extension division and the teaching staff of the college, R. W. Stimson, A. Vivian, and K. L. Hatch (*Fed. Bd. Vocat. Ed., Vocat. Summary, 2* (*1920*), *No. 9, pp. 153, 162, 163*).—This is the report of a committee of the American Association for the Advancement of Agricultural Teaching submitted at its meeting November 11, 1919. It is based on replies to inquiries addressed to the presidents of the State boards for vocational education, the deans or presidents and extension service directors of the State colleges of agriculture, and the State supervisors of vocational agricultural education in all States.

The returns indicate that harmony prevails among these agencies in most of the States, and that at least 15 States have provided for teamwork in written agreements, while in 17 States informal agreements are reported to be operating satisfactorily. The committee briefly gives its views regarding a well-balanced State plan of agricultural education, and submits condensed recommendations for the discussion of possible policies and plans in the preparation of a sound and workable program.

Plan for vocational education in the State of Louisiana (*Baton Rouge, La.: State Dept. Ed., 1919, pp. 40*).—The requirements for vocational education in the State of Louisana are outlined. It is intended to use 40 per cent of the teacher-training funds for agricultural subjects and 30 per cent for home economics subjects. The Louisana State University and Agricultural and Mechanical College has been designated for the training of white teachers of vocational agriculture and home economics, and the Southern University and Agricultural and Mechanical College for the training of negro teachers in these subjects. Outlines of 4-year type courses in vocational agriculture and home economics and 4-year teacher-training courses in vocational agriculture and home economics are included.

Vocational education in Maryland, 1919, L. A. Emerson (*Baltimore, Md.: State Dept. Ed., 1919, pp. 63*).—This publication contains a report on the progress of vocational education in Maryland in 1918–19, including war training courses, and an outline of the State plans for the administration of vocational education in 1919–20. Outlines of 2- and 4-year type courses in vocational agriculture, type courses in vocational home economics, and 4-year teacher-training courses in vocational agriculture and home economics are included.

In vocational agriculture a great deal of emphasis was placed on the project work and its correlation with classroom instruction. During the first year of the inauguration of the teacher-training work it was organized as a division of vocational education of the Maryland State College of Agriculture, but as a result of the recent reorganization of the college the vocational work is now a part of the school of education, which includes a department of agricultural education.

Vocational agricultural education in Mississippi (*Miss. Dept. Pub. Ed. Bul. 13 (1919), pp. 111*).—This bulletin outlines the requirements in equipment, instruction, supervision, etc., that must be met by Mississippi schools giving courses in vocational agriculture in order to be eligible to receive Federal aid under the provisions of the Smith-Hughes Act. Definite suggestions are offered for conducting supervised practice work and the three general forms or ways of securing such work, viz, the home or school project, practical work on school grounds, and community or agricultural extension work, are compared on the basis of the educational aims served. Project study outlines for gardening, growing Irish potatoes, cotton, corn, and peanuts, and raising poultry and pigs; an outline guide to better teaching; an outline of the organization and policies for county agricultural high schools formulated and agreed upon in a series of district conferences; important summer activities of the agricultural teacher, and record and report blanks are included.

Report on the Agricultural Instruction Act, 1918–19, J. H. Grisdale (*Canada Dept. Agr. Sess. Paper 15a (1920), pp. 48*).—This report deals with the work carried on in 1918–19 under the Agricultural Instruction Act in Canada.

The amounts actually expended during the year included $282,851 for agricultural colleges and schools; $621,450 for instruction and demonstration including the whole or the larger proportion of the cost of maintenance of the agricultural representatives and their offices, agricultural credit courses, cooperation and marketing, live stock, dairying, poultry husbandry, and fruit and vegetables; $27,047 for women's work; $163,647 for elementary agricultural education in public, high, and normal schools, teacher training, school gardens, nature study, domestic science, and school fairs in part; $15,556 for boys' and girls' clubs; and $25,000 for veterinary colleges. The colleges and schools benefiting from the grant are the Ontario Agricultural College at Guelph and the Agricultural School at Kemptville, Ont.; the Macdonald College and the schools of agriculture at Oka and Ste. Anne de la Pocatière in Quebec; the College of Agriculture of the University of Saskatchewan; the agricultural schools at Claresholm, Olds, and Vermilion in Alberta; and the College of Agriculture in British Columbia.

It is held that the agricultural club work, as the logical outcome of nature study and elementary agriculture, should be developed as an integral part of the school system or in very close alliance with it. In Manitoba 10-day short courses in woodworking were held during July and August to meet an insistent demand by the senior members of the boys' and girls' clubs. In Saskatchewan the rural education association movement has developed so rapidly that a director was appointed in 1918.

The Ohio plan for the training of teachers and the improvement of teachers in service, W. F. STEWART (*U. S. Bur. Ed., Higher Ed. Circ. 18 (1919), pp. 7*).—This paper was presented at the meeting of the American Association for the Advancement of Agricultural Teaching on November 11, 1919. It describes the plan for teacher training adopted by the Ohio State University, which provides for observation and practice work in five rural high schools that are so accessible by interurban and automobile service as to make unnecessary an absence for more than one-half day from the campus. The vocational agricultural departments in these high schools are in charge of well-qualified teachers who are ranked as instructors in the department of agricultural education of the university. Teacher-training students taking the observation work leave open for it at least one afternoon each week, and are required to visit each of the five training schools three times during the semester and to make two additional visits to two schools other than the training schools which are maintaining departments, making a total of 17 visits. Upon the submission of satisfactory reports on these visits, credit in the course is granted. The local teacher serves as the critic teacher.

In the plan for the improvement of teachers in service the following five agencies are employed and are briefly discussed: Sectional meetings at State teachers' associations, district conferences of vocational teachers, the services of a utility instructor, assistance from supervisors, and news letters and personal letters. The teachers assisted under this plan are all agricultural college graduates.

Agricultural botany in secondary education, H. F. ROBERTS (*Science, n. ser., 50 (1919), No. 1303, pp. 549–559*).—The author concludes that a course in agricultural botany for secondary schools should differ from the ordinary academic course in the same subject in the following respects: (1) In the aim of the course, which is the economic advantage of the pupil rather than the professional array of the subject from the standpoint of discipline; (2) in the means used for botanical instruction, the seed plants being largely employed as teaching material for practical purposes; (3) in the extensive use of plants of economic value as the means through which to study plant structure and functions." Suggestions are offered for following this method.

In his opinion a course in botany in all communities and especially in rural communities "should have three fundamental objects—to stimulate observation, to give such botanical knowledge and training as will be most useful, and to impart culture." These three leading motives are briefly considered.

How to raise standards in veterinary education, W. N. Berg (*Jour. Amer. Vet. Med. Assoc., 56 (1919), Nos. 2, pp. 125–139; 3, pp. 270–278*).—The author calls attention to the lower standards in veterinary education as compared with those in human medicine, and reviews the progress of medical education since 1904 brought about by the American Medical Association through a determination of the medical needs of the country, the classification of medical schools, publicity, etc. In his opinion the same should be done by the American Veterinary Medical Association for veterinary education. In a comparison of the minimal requirements in the selection of the student body and of the teaching body, as defined by the Council of Medical Education for medical schools and the Bureau of Animal Industry, U. S. Department of Agriculture, for veterinary colleges, it is shown that for the medical schools and the veterinary colleges, respectively, the admission requirements are 4 years' high school work and 2 years' college work, and 2 years' high school work; the teaching weeks per college year 32 and 28; the total hours in the 4-year course 3,840 and 3,880; full-time instructors on the faculty 8 and 0; part-time instructors on faculty 0 and 5. Statistical tables are included as an example of the numerous publicity activities of the Council of Medical Education in its desire to inform prospective students of the relative merits of the various schools.

Home economics, H. W. Calvin and C. A. Lyford (*U. S. Bur. Ed. Bul. 50 (1918), pp. 38*).—This is a survey of the progress in the years 1916–1918 in home economics education. It deals with the development of this subject in public, normal, and colored schools, and in colleges and universities; State and county supervision; the effect of war on college courses; practical application of food courses in the management of lunch rooms and cafeterias and in cooperating with fraternities, dormitories, and boarding houses; Smith-Lever extension work; new phases of home economics including nurses' courses, experiment station work in home economics, at the University of Nebraska the cadetting in the city schools of students in the special methods course under the joint supervision of a member of the university home economics staff and the city supervisor, itinerant teacher training, commercial clothing manufacture, etc.; child welfare courses; newly established and reorganized departments, and departments in which there has been unusual growth; etc.

Illustrated lessons in agriculture, G. A. Bricker (*Columbus, Ohio: Kauffman-Lattimer Co., 1919, pp. 185+[2], figs. 86*).—This manual is intended as an instruction book for teachers to accompany the author's agricultural charts and apparatus. It comprises a lesson on each of the 12 charts, including the walking plow, wheat, corn, spraying for the codling moth, grafting, the dairy cow, the beef animal, the farm horse, the hog and the sheep, the chicken, clover, and soil fertility; also exercises in soils and drainage in connection with the drainage apparatus. Each lesson consists of subject matter, practical exercises, and references to literature.

How teachers may use Farmers' Bulletin 602, Clean Milk: Production and Handling, A. Dille (*U. S. Dept. Agr., Dept. Circ. 67 (1920), pp. 6*).—Suggestions are offered to teachers, especially in rural elementary schools, on the method of using the information contained in Farmers' Bulletin 602 (E. S. R., 31, p. 771) on the production and handling of clean milk.

Organization and results of boys' and girls' club work (Northern and Western States), 1918, O. H. Benson and G. Warren (*U. S. Dept. Agr., Dept. Circ. 66 (1920), pp. 38, figs. 14*).—This circular gives an account of how boys' and girls' club work has been organized and conducted in different stages of its development in the Northern and Western States and some of the results achieved during 1918.

School fairs in 1919 (*Agr. Gaz. Canada, 6 (1919), No. 12, pp. 1058–1065, figs. 4*).—Notes are given on methods of organizing and conducting school fairs in 1919 in Prince Edward Island, Nova Scotia, Quebec, Manitoba, and Saskatchewan.

MISCELLANEOUS.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta. Mo. Bul., 7 (1920), No. 10, pp. 153–176, figs. 8*).—In addition to articles abstracted elsewhere in this issue, this number contains brief articles on the following subjects: Raising the Dairy Calf, by L. E. Carter; The Disease Factor in Fruit Growing, by A. Frank; and Report of Western Washington Egg-laying Contest for the Month of November, 1919, by G. R. Shoup.

Transactions of the Third International Congress of Tropical Agriculture (*Trans. 3. Internatl., Cong. Trop. Agr. 1914, vols. 1, pp. XI+728, pls. 2, figs. 8; 2, pp. X+710, pls. 4, figs. 39*).—Volume 1 contains the papers presented to this Congress held at London, June 23–30, 1914, on technical education in tropical agriculture, the organization of agricultural departments in relation to research, sanitation and hygiene on tropical estates, agricultural credit banks and cooperative societies, legislation against plant diseases and pests, cotton, fibers, and rubber. Volume 2 contains the remaining papers (except those presented by the Portuguese section, which have been printed separately), and deals with cereals, sugar, cocoa, tobacco, oils and oil seeds, the fertility of soils in the Tropics, and miscellaneous subjects.

Modern progress in agriculture, D. HERMENEGILDO GORRÍA Y ROYÁN (*Mem. R. Acad. Cien. y Artes Barcelona, 3. ser., 14 (1918), No. 9, pp. 47*).—This is an inaugural dissertation reviewing recent progress in agriculture, notably in agricultural instruction and extension work, agricultural organizations, Government protection of agriculture, radioculture, electricity as applied to agriculture, mechanical cultivaton and agricultural machinery, special crops, nutrition of plants, agricultural bacteriology, plant pathology, dry farming, and farm management, with special reference to prevailing conditions in Spain.

Farm memorandum book (*Agenda Aide-Mémoire Agricole. Paris: J. B. Baillière & Sons, 1918, pp. XII+246+*[76]*+148+*[20], *pl. 1, figs. 32*).—This is a pocket manual of agricultural information published under the direction of G. Wery, including many useful tables and other data, forms for farm records, a farm calendar and diary, data as to French laws and regulations, an extensive bibliography of French books on agriculture, etc.

NOTES.

Purdue University and Station.—O. E. Reed, head of the department of dairying, has resigned to become superintendent of production for a large stock-breeding corporation. J. Howard Roop, deputy State chemist in the feeding stuffs control work, has resigned to engage in commercial work.

Kansas College and Station.—Since 1900, when the first strictly agricultural class was graduated, a total of 819 students have completed the 4-year course in agriculture. According to the latest information at hand, 50 per cent of these graduates are engaged in farming; 36 per cent are engaged in investigation, teaching, extension, or other professional agricultural work; and 14 per cent are engaged in nonagricultural occupations.

The students in the farmers' short course, which closed February 28, aggregated about 125 and represented 5 States and 59 Kansas counties. Ninety-eight per cent of these students live on farms; 50 per cent are working for their parents; 20 per cent are farm owners; 18 per cent are tenants; 6 per cent are farm managers; and 6 per cent are hired farm laborers. With reference to education, 92 per cent had finished the eighth grade, 52 per cent had had some high-school training, and 14 per cent had had some college training. The number of students registered in each of the 27 subjects offered varied from 5 to 106. The most popular courses as indicated by the registration were soil management, live stock production, live stock sanitation, grain crops, forage crops, farm management, and field machinery.

The eighth annual convention of Kansas live stock feeders was held at the college on March 20. The attendance exceeded 1,000, and represented about 80 counties of the State. The principal feature of the convention was a report on the results secured during the past winter in the station's feeding experiments with 100 steers, 240 hogs, and 445 lambs.

N. E. Olson, in charge of dairy manufacturers, resigned April 1 to engage in commercial work.

Louisiana Stations.—Seth S. Walker, soil chemist at Baton Rouge, has resigned to engage in commercial work in Florida.

Minnesota University.—According to a note in *Minnesota Farm Review*, W. W. Guosseff, in charge of dairy and animal husbandry work at Crookston, has resigned to become secretary of the Illinois Duroc-Jersey Breeders' Association.

Mississippi Station.—The State legislature has made its initial appropriation for the support of the main station, allotting $46,300 for the ensuing biennium as well as doubling the appropriation for the substations. The State appropriations for this period for experimental work will aggregate $176,900.

New Hampshire College.—A $10,000 stock barn authorized by the 1919 legislature is nearing compeltion. It is a 2-story structure 40 by 65 feet with a 1-story ell 32 by 60 feet, and is thoroughly equipped with modern appliances. Provision is made for 30 head of sheep, 18 of cattle, and 4 horses. An appropriation of $5,000 is also available for the purchase of pure-bred live stock, and is being expended for Herefords, milking Shorthorns, and Percheron horses.

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EXPERIMENT STATION RECORD.

Vol. 42. May, 1920. No. 7

With the development of the system of agricultural extension in the past few years, the class of workers known as "specialists" has come into increasing prominence and has already assumed an important rôle. The necessity for their provision as a part of the extension forces was for a time overlooked, because of the prominence given to the activities of the county agents, home demonstration agents, and boys' and girls' club agents. These carried the work so much more directly and intimately to the farmers and their families than had ever been done before that for a time the system seemed adequate in itself, with the aid of such specialists as already existed in the colleges and experiment stations.

It is now becoming more evident, however, that the provision of this group is a logical development, and contributes not only a material element of strength but provision for steady growth in extension teaching. The subject matter with which extension deals is in large measure of quite technical nature, originating outside the forces and calling for considerable of interpretation and guidance in its introduction. The various groups of agents are required to cover such broad fields and deal with so many subjects that they can not be expected to function as specialists, and are often in need of guidance in technical matters. Where such guidance and assistance is not provided in the extension organization, they must needs depend on the experts in the college teaching departments and the experiment stations, all busy men and engrossed in their particular duties.

Hence the extension specialist meets a real need and fills an important place in the general scheme. His activities have not always been fully formulated, and have varied considerably in different localities. To some extent his work has been of miscellaneous and propaganda character rather than directed specifically to definite functions, and this has tended to make the necessity for his services less clear in the minds of some people.

The particular field and function of extension specialists is becoming increasingly apparent as their activities assume more definite form, but there is still some lack of understanding of their work and its distinctive features as well as of the need of it in the extension system. The following observations are offered as a contribution to the subject, without attempt to cover it completely, but with a view to making this feature of the work better understood. It is based on a study of the evolution of the specialist and the experience which has been had in the working out of his particular field and function.

The county extension agents, who are nearest the farmer and on whom the call comes first for information and help on practically every phase of agriculture and rural life, are the first to realize how relatively meager their own information on technical agriculture really is. This is so even though they have lived on a farm all their lives and been trained in our best colleges of agriculture. Like the country doctor, they may be good general practitioners but are constantly running across cases requiring the increased technical knowledge of a specialist for successful handling. Hence the need for extension specialists who can aid the county agents on matters of this kind; and it is from these agents that the call for the assistance of such specialists is particularly strong.

Again, the county agents are extremely busy men and women. Calls for their services cover all the working hours of the day, running more frequently than not into the late night, and involving winter and summer demonstrations, field meetings, consultations, lectures, committee meetings, campaigns, publicity and all such matters in which a rural community may be interested. Not only are all the week days filled, but the holidays and Sundays are broken into because of emergencies that come up on one farm or in one community or another throughout the county. This makes it difficult, if not impossible, for the county agent to find sufficient time to read and keep up with the progress in all the different lines upon which he is called to advise; and since he lives among his clients, and a whole year's plans, involving frequently considerable investments, are contingent upon his counsel being sound and up to date, he is keenly alive to the responsibility of his position and to the need of having someone on whom he may call for information and counsel from time to time.

The main reason for having extension specialists, however, is that the research departments of the agricultural colleges and the United States Department of Agriculture through their investigations and inquiries are constantly adding to or correcting our fund of agricultural information. The results of these investigations are frequently quite technical in character, and if they were simply reported in the ordinary way farmers and their advisers might fail to get their full significance or to understand the exact technique of procedure in applying them. Personal explanation and visual demonstrations of the results are often absolutely essential if farmers are to grasp their meaning and get the full benefit of them, and this applies likewise to the various classes of extension agents.

The specialist is thus a link in the present system. In a sense, he is continuing what was done by the research specialists before the present extension organization was provided, although he deals mainly with a different group through whom he works. It will be recalled that before the advent of the present county extension system, with its paid county agent, home demonstration agent and boys' and girls' club agent, specialists from the college and station were accustomed to carry on their work with the farmers through lectures, bulletins, circulars, press notices, and direct dealing with individuals or associations. These specialists were therefore the forerunners of the more recent groups of agents in matters of publicity and popular teaching. Their activities in this respect were not very definitely organized or directed, and dealt mainly with groups of farmers rather than with individuals. They were in considerable degree free lances, and an individual in his work usually covered an entire State; hence they were able to do little more than scatter the seed without much opportunity for follow-up work to see that it took root and grew.

With the coming of the county agents, however, and the development of county extension organizations, an opportunity was afforded the specialists for planning a system of instruction which should reach all the farmers who could be interested, by means of local agents working under his guidance. With this was coupled the possibility of close and regular follow up, to see that his teachings were understood and applied, and that the expected beneficial results accrued.

The county agent system has developed very rapidly, so much so that the specialist is often just beginning to see clearly this new channel through which he may work, and the big opportunity it offers him for rapidly and effectively extending his message. The use of this system calls for a considerable modification of his previous method of work, so as to provide a well thought out, definitely planned program in which to a considerable degree he will be a teacher of leaders. With the county agricultural agencies, including the farm bureaus and community organizations, now available through which extension specialists may work, the need of such definite program on his part is important. Scattered, unorganized, disconnected efforts which mark no substantial advance should not form a part of the present day extension program, but the work of each group should be systematized and made to supplement and strengthen that of the others.

Stated briefly, the extension specialist in the present extension system is the agent whose duty it is to see that the practical results of research along his particular line, as they are developed by the experiment stations, the Federal Department of Agriculture and other institutions, are put in usable form and brought to the attention of rural communities in a way that will benefit the maximum number of people. He heads up, from the extension standpoint, his line of work in the State, and imbues the various groups of extension agents and the county and community committeemen with what is right and sound to be done; and through these his influence reaches to the ultimate demonstrators. It rests largely with him in the first instance to determine what should be taught and how it should be presented; and beyond this he assists the other agencies in the development of the best kind of organization for accomplishing their purposes. In addition he may work through the various farmers' organizations and farmers' clubs in promoting his work.

A State dairy extension specialist, for example, would first consider what information along dairy lines the colleges had that would be helpful to dairy farmers and the dairy industry of that State; he would chart and map the dairy situation in the different sections of the State so that he could see at a glance what kind of dairy extension work each section was in most need of; and he would consider the agencies through which he might best work to reach the maximum of people interested in each of the different phases represented. Among these agencies the farm bureau or county organization with its complement of agents and of county and community committeemen, would appeal to him first, since extension work is their business and they are a part of the State and national system. He might also consider the possibilities of extending his message through the various dairy associations of the State, breeders' associations, etc.

In considering the county extension agencies, the dairy specialist would concern himself with the problems of each of the counties in which there were such agents and the training in dairying which each agent had received. If these agents were not already meeting the dairy needs of the county, the dairy specialist would aim to present the situation to them and the improvements possible, in such a way as to arouse their interest and secure their support in bringing the matter to the attention of the farmers. In this way the wishes of the farmers in regard to dairy extension work would be ascertained, and if they decided they would like to try out some of the matters suggested, it would be the business of the extension specialist to see that the county agents, county committeemen, etc., were properly instructed. If necessary he would conduct three or four meetings with farmers in such county, to show not only the farmer but especially those responsible, just what the new phase of work was, and just how it should be handled in order to teach the thing desired for the improvement of the dairy industry in that community.

The aim of the successful extension specialist is therefore to go far enough to assure himself that the local agencies through whom he is working thoroughly understand the message, are competent to present it effectively, and will continue to carry forward and organize the work with farmers in additional communities. In this effort the extension specialist finds his most effective method of teaching is the actual showing of these various agents just how to conduct the demonstration on a farmer's farm, in the farmer's barns, or feed lot, or in the farmer's home. He then goes on to another county to teach the county extension agents there, and after convincing himself that the agents there have his message and can extend it, he will go to the third and fourth counties, and so on to all the county agents of the State needing his help.

Particular attention may be called to the growing practice among extension specialists of so organizing their work that it may be extended through the home demonstration agents and boys' and girls' club agents, as well as through the county agricultural agents. Not only is it desirable to interest the farmer in what the specialist has to extend, but also the farmer's wife if the matter is at all suitable, and especially the farm boy and girl. Indeed, the extension specialist who fails to plan his work so that farm boys and girls may take part in it fails to utilize one of the most efficient agencies available for teaching better agricultural and home practices both to present and future farmers.

It may be set down, therefore, that the first business of an extension specialist in getting his subject before the farmers of the State is to interest and instruct particularly the county agents, the home demonstration agents, and the boys' and girls' club agents in the subject which he represents. He is essentially the teacher of these leaders. The better he teaches these leaders and the more thoroughly they are made to understand the subject, the more certain they are to teach and extend the message the specialist desires.

All do first and most eagerly the things they know best. A county agent or club agent or local committeeman will be lukewarm in pushing a subject he does not understand. It is not enough, therefore, for a specialist to visit a county agent or boys' and girls' club agent once, but he must repeat his visits and instructions until such agents are thoroughly grounded in the subject. Then he must maintain the continued interest of each agent with whom he works by keeping closely in touch with him by correspondence and otherwise. He will furnish them with new charts, new lantern slides, and literature which can be used in presenting his subject. The specialist must constantly be studying, planning, and developing new ways, new material, and publicity matter for presenting and sustaining interest in his subject, and must furnish this material freely and fully to the agents in the field if he expects their support in fullest measure.

It will thus be seen that the aim of the present day extension specialist should be to tie to him first of all the county agent, the home demonstration agent and the county club agents, by keeping them fully informed as to the whole philosophy and plan as well as the details of his work, since these forces remain permanently in the county and are in constant touch with the farmer. The extension specialist may not be able to return to the county more than once or twice a year, and with only such occasional visits he can not hope to reach the farmers or their families in any intimate instructional way except the few he may work with as a means of teaching the local agents and committeemen. Nor is this necessary. But he can teach and leave his message with the local forces and the men cooperating with them in forwarding it, and he needs to make his work with this limited group so effective that they can represent him in carrying it on directly with the farmers. In this way he can reach thousands where by the old method he reached but tens.

The extension specialist usually finds that after he has given his message to a certain number of agents, and the agents begin to put the material out, some of them will do it much more effectively than others. Indeed, there are likely to be some agents who will do the work along some one line or other more effectively than the specialist himself, while others may fall far below the desired accomplishment. The specialist therefore has an important function in helping the agent below par to become more efficient. He becomes a common carrier from agent to agent of the best methods as developed by the agents themselves, and these best methods will relate for the most part to means or organizations to effectively reach the maximum number of farmers. In his subject therefore the extension specialist is not only a teacher of subject matter, but he is also an adviser on the best methods of organizing his particular line of work.

In counties without farm bureaus or county agents, the specialists have another task in getting their information to the farmers. But it is not the purpose to take up that phase of the work at this time. That is another story, but a minor one.

From the above discussion it may be concluded that the function of the extension specialist has come to be a very important one in extension work. These specialists are in considerable degree dealing with leaders and trained men, and consequently their technical training in their respective subjects must be such as will command the respect and meet the needs of the agents and the best farmers with whom they will do most of their work. Furthermore, since they are working through others in an advisory way rather than as administrators, they must be broad minded, forward looking and inspiring men, and possessed of both tact and judgment in dealing with others.

While, as stated at the outset, the demand for extension specialists now comes largely from the county agents and most advanced farmers, it should be understood that this demand is for specialists thoroughly trained in their subjects and willing to work with others cooperatively. The character of the service and its particular requirements call for the careful selection and proper training of persons for it. This training needs to take account not only of technical knowledge and its application in practice, but the qualities and ability to develop successfully the teaching attitude. There is believed to be opportunity for a larger number of extension specialists whose training meets the high standard set for this responsible type of service.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The cause of deterioration and spoiling of corn and corn meal, J. S. McHargue (*Jour. Indus. and Engin. Chem., 12 (1920), No. 3, pp. 257–262, fig. 1*).—This contribution from the Kentucky Experiment Station reports the results of an extensive investigation of the underlying causes of the deterioration and spoiling of corn and corn meal during storage or while in transportation.

The fundamental cause of deterioration was found to be excessive moisture. The laboratory experiments reported indicate that sound corn containing 12 per cent of moisture can be kept in good condition in storage for at least 12 months, provided it is not exposed to conditions in which moisture can be absorbed. Corn containing 15 per cent of moisture will mold if confined in airtight vessels at ordinary temperature, and if the moisture content reaches 20 per cent alcoholic and acid fermentations will result.

Similar experiments with meal ground from whole grains of sound corn containing 12 per cent of moisture indicate that, while more susceptible to hydrolytic changes resulting in an increase in acidity, such meal can be kept for a period of 12 months when air and moisture are excluded without acquiring any musty or sour odor. "How seriously this increase in the acidity of the oil affects the palatableness and wholesomeness of bread made from such meal remains to be determined in future experiments. Except from the standpoint of acidity, the meal is apparently in a perfectly sound condition and has even retained a nutty odor." By still further lowering the moisture content of the meal the development of acidity may be reduced to a negligible quantity. By storing at a lower temperature the development of acidity may also be retarded.

The different species of molds which developed in some of the samples of corn and corn meal under unfavorable conditions were isolated, grown in pure cultures, and identified. These include *Penicillium expansum*, which was observed only on the germ of the corn and which made the most prolific growth of any of the species; *Aspergillus glaucus* and *A. albus*, which developed in isolated clusters on the germ; and *Citromyces* sp., which grew vigorously on the degerminated part of the corn.

In applying the results of this investigation to problems of commercial handling of corn the author states that "apparently the reabsorption of moisture is a very important cause of the spoiling of large quantities of export corn while in transit to European ports. If corn containing no more than 12 per cent of moisture were stored in perfectly dry holds and so protected that moisture could not enter, there appears to be no reason why such corn should not keep in a sound condition during transportation on the ocean." Similar protection of corn meal is thought to be sufficient to insure its preservation for comparatively long periods of time, and to obviate the necessity of degerminating the corn previous to grinding, a practice which is considered by the author not only to be unnecessary but to be harmful from the standpoint of nutrition.

The quantities of preservatives necessary to inhibit and prevent alcoholic fermentation and the growth of molds, M. C. Perry and G. D. Beal

(*Jour. Indus. and Engin. Chem., 12 (1920), No. 3, pp. 253–255, figs. 2*).—This paper reports a study of the amount of various food preservatives required to check alcoholic fermentation, to inhibit decomposition by yeasts and molds, and to destroy all living organisms in standard 1 per cent dextrose broth.

The medium was prepared by sterilizing a known volume of 2 per cent dextrose broth and adding sterile water and preservative to double the original volume. After inoculation the tubes were allowed to stand at room temperature for from four to eight days according to the time required to produce visible growth in check tubes containing no preservative. The organisms studied were pure cultures of *Saccharomyces cerevisiæ* and *Penicillium glaucum*, and the preservatives selected were absolute alcohol, sodium salicylate, sodium benzoate, sodium sulphite, sodium hydrogen sulphite, and formaldehyde. The results obtained, which are presented in both graphic and tabular form, may be summarized as follows:

The inhibitive effect toward *S. cerevisiæ* was noted at 0.25 per cent concentration of formaldehyde and sodium hydrogen sulphite, 0.5 per cent sodium benzoate, 0.6 per cent sodium sulphite, 1 per cent sodium salicylate, and 11 per cent alcohol. For complete sterilization the order was slightly different, both sodium benzoate and salicylate being more effective than the sulphites.

The inhibitive effect upon *P. glaucum* was noted at the following concentrations of preservatives: 0.25 per cent of formaldehyde, sodium hydrogen sulphite, and sodium benzoate, 3 per cent of sodium salicylate, and 8 per cent of alcohol. No inhibitive effect was observed at 12 per cent concentration of sodium sulphite. The same relative order held for complete sterilization.

A method of testing the amylolytic action of the diastase of Aspergillus oryzæ, S. A. WAKSMAN (*Jour. Amer. Chem. Soc., 42 (1920), No. 2, pp. 293–299*).—Attention is called to the distinction between the amylolytic (amyloclastic, liquefying) power and the saccharogenic (saccharifying) power of diastatic enzyms for starch, and it is pointed out that in the majority of investigations on the action of diastase the saccharogenic rather than the amylolytic power has been measured. The investigations reported in this paper were undertaken with a view to finding the best methods for the measurement of the amylolytic power of diastatic enzyms with reference to their suitability in the textile industry for the desizing of fabrics.

The method adopted is based upon the disappearance of raw starch in a solution without considering how much has been hydrolyzed to dextrins and how much to sugars. Dry potato starch was first treated with a 0.5 per cent solution of neutral red until the color was absorbed, and then washed repeatedly with water until the supernatant liquid became almost perfectly clear. The colored starch was then dried and a 2 per cent solution prepared in the usual manner. In making the test, this paste was introduced in 10 cc. portions into large test tubes which were placed in a thermostat at 40° C. until this temperature had been reached, when the enzym was added and the tubes shaken and placed back in the thermostat. As soon as the starch had hydrolyzed, the solution lost its opacity and became clear, this end-point being more easily recognizable by the color imparted to the starch by the neutral red.

The amylolytic power can be calculated from these determinations by making use of the fact that the product of concentration of the enzym by the time of action is constant within certain limits. A unit of enzym is taken as the amount of enzym which will liquefy 10 cc. of 2 per cent raw potato starch in 30 minutes at 40°.

Data presented on the starch liquefying powers of malt enzyms and enzyms obtained from *A. oryzæ* (commercial name Polyzime) and on the corresponding

Lintner values show that the first give a higher Lintner value while the second give a higher liquefying value, the latter being from four to six times as great as that of the malt preparations. It is pointed out that this confirms the results of Sherman and his associates (E. S. R., 36, p. 315) on the relative amylolytic and saccharogenic powers of these diastases.

Contribution to the chemical investigation of hardened fats, with special regard to their content in nickel and arsenic, G. Riess (*Arb. Reichsgsndhtsamt., 51 (1919), No. 3, pp. 521–531*).—An investigation of hardened vegetable and fish oils is reported, which included determinations of their physical and chemical constants and of their content in nickel and arsenic. The materials examined included hardened cottonseed, peanut, and linseed oils, and hardened whale oil. Determinations of arsenic were made by the method of Beck and Merres previously noted (E. S. R., 36, p. 806). Nickel was determined by a shaking-out method, the technique for which is as follows:

About 200 gm. of the hardened fat was melted in a long-necked flask, and about 100 cc. of 12.5 per cent hydrochloric acid and a small amount of potassium chlorid were added. The flask, the neck of which was covered with a watch glass, was heated for an hour on a water bath with frequent shaking. After cooling to solidify the fat, the solution was filtered and an aliquot part of the filtrate evaporated to dryness in a porcelain dish. The residue was dissolved in water, heated with excess of ammonia, filtered, and the filtrate tested for nickel with dimethylglyoxime solution.

The experimental data reported indicate that the hardened oils examined showed no marked differences in physical and chemical properties from the ordinary edible fats, and contained practically negligible quantities of nickel and arsenic.

Cyanogenesis in Sudan grass: A modification of the Francis-Connell method of determining hydrocyanic acid, P. Menaul and C. T. Dowell (*Jour. Agr. Research* [*U. S.*], *18* (*1920*), *No. 8*, *pp. 447–450*).—Determinations of the hydrocyanic acid in Sudan grass are reported from the Oklahoma Experiment Station. Some of the analyses were made by the method previously described by Dowell (E. S. R., 40, p. 804) and one or two by a modification of the Francis-Connell method (E. S. R., 30, p. 709). This modification, which is described in detail, consists essentially in removing the colloidal sulphur formed in the Francis-Connell method by evaporating the solution to dryness on a water bath at 70° C. and heating the residue to 130° for 5 minutes, after which the solution, slightly acidified with hydrochloric acid, is treated with cadmium chlorid until the sulphur is entirely precipitated. The maximum intensity of color in the final reaction was found to occur when 5 cc. of a 10 per cent ferric chlorid solution was used in 100 cc. of the solution, the standard solution for comparison containing 5 mg. of HCN as KCN.

A table is given of the percentage of hydrocyanic acid in Sudan grass at different stages of growth. This shows that the Sudan grass contains about one-third as much hydrocyanic acid as do the grain sorghums. As has been found with other sorghums, there is a decrease of hydrocyanic acid with growth, and more of the acid is present in the leaves than in the remainder of the plant. A number of determinations indicate that there is more hydrocyanic acid in the plant in the morning than in the afternoon, the amount decreasing in the one case reported in the table from 0.0052 per cent (in the whole plant calculated on fresh basis) for grass cut in the morning to 0.0035 for grass cut in the afternoon of the same day.

Purification of compressed gases in testing catalysts for ammonia synthesis, R. O. E. Davis (*Jour. Indus. and Engin. Chem., 12 (1920), No. 3, pp. 289, 290, figs. 3*).—The method of purification of gases used in testing catalysts at the Arlington, Va., plant in work on the synthesis of ammonia carried on in cooperation between the Bureau of Soils, U. S. Department of Agriculture, and the Nitrate Division of the War Department is described. Illustrations are given of two of the purification chambers employed and of the assembled apparatus used for analyzing gases for oxygen and moisture.

Purification of benzoic acid by fractional condensation, M. Phillips and H. D. Gibbs (*Jour. Indus. and Engin. Chem., 12 (1920), No. 3, pp. 277–279, fig. 1*).—The authors at the Bureau of Chemistry, U. S. Department of Agriculture, describe a method of purifying benzoic acid or other volatile solids based on the principle of fractional condensation.

The apparatus used consists of a kettle filled with lubricating oil, in which is immersed a pot provided with a 1-in. iron pipe extending into the first condensing chamber and surrounded by a copper coil terminating inside the pot. The condensing chambers consist of cylindrical wire screens, 0.25 in. mesh, of different diameters placed concentrically on a thick reinforced glass plate, which is further insulated from the heat of the oil bath by two sheets of asbestos. Another glass plate provided with openings for thermometers in each chamber is placed over the chambers.

In operation the pot is about three-fourths filled with the crude benzoic acid and the oil bath and chambers are heated, the latter by passing in a stream of hot air. When the temperature in the first chamber is about 50 or 60° C. and that of the oil bath about 120°, the air flow in the chamber is discontinued and the air passed at a definite rate through the copper coil and into the pot. The acid volatilizes and passes through the iron pipe into the first chamber. On passing through the successive screens the moving stream of vapor loses its heat gradually and condenses on the surface of the screen.

Indicators and their industrial application, H. A. Lubs (*Jour. Indus. and Engin. Chem., 2 (1920), No. 3, pp. 273, 274, fig. 1*).—The author reviews recent developments in the field of indicators, and discusses briefly the application in some of the chemical manipulations of the dye industry of the series of indicators developed by Clark and Lubs at the Bureau of Chemistry, U. S. Department of Agriculture (E. S. R., 37, p. 506).

For general laboratory use methyl red and thymolsulphophthalein are recommended if only two indicators are to be selected, but the whole series is considered desirable for very accurate work.

Further work on acid potassium phthalate as a standard in volumetric analysis, W. S. Hendrixson (*Proc. Iowa Acad. Sci., 25 (1918), pp. 501–504; also in Jour. Amer. Chem. Soc., 42 (1920), No. 4, pp. 724–727*).—The author reports a further study of the properties of acid potassium phthalate and its value as a standard in volumetric analysis as recommended previously (E. S. R., 34, p. 408). The laboratory work, which was performed by S. G. Norton under the direction of the author, included determinations of the number of crystallizations of the salt necessary to secure a sufficiently pure product, of the yield on the basis of the phthalic anhydrid used, and of the hygroscopic properties of the salt.

Three crystallizations in all of the salt were found to give a product of the necessary purity. A yield of about 50 per cent of the theoretical was obtained after four crystallizations from hot water. The hygroscopicity of the salt was practically nil, and its solubility at 25° C. was 10.23 per cent and at 35°, 10.25 per cent.

The determination of chlorin with the nephelometer, A. B. Lamb, P. W. Carleton, and W. B. Meldrum (*Jour. Amer. Chem. Soc., 42 (1920), No. 2, pp. 251–259*).—A study is reported of the suitability of the nephelometric method for determining minute amounts of chlorin in alcoholic solutions. The results obtained are summarized as follows:

"In a 50 per cent alcohol-water solution, heating silver chlorid suspensions of widely differing concentrations to 40° C. for 30 minutes after precipitation produces a more intense and constant opalescence than can be attained at room temperature; further heating for 30 minutes at 40°, or standing at room temperature for an hour, produces no perceptible change in this opalescence.

"Using this technique, chlorids in such solutions can be estimated with an average deviation of about 3 to 4 per cent over concentrations ranging between 4 and 300×10^{-6} M. Opalescence in such solutions decays more rapidly in diffuse daylight than in the dark. The opalescence of the same quantity of silver chlorid in water is about 15 per cent greater than in 50 per cent alcohol or 50 per cent acetic acid."

A study of the determination of amino acids by means of the hydrogen electrode, E. L. TAGUE (*Jour. Amer. Chem. Soc., 42 (1920), No. 2, pp. 173–184, figs. 2*).—A method for the electrometric titration of amino acids in solution is described which takes into account the fact that such substances require the presence of an excess of OH-ions before they will show their maximum acid characteristics, or an excess of H-ions before they will show their maximum basic nature. In neutralization a certain proportion of the added OH-ions is consequently used up in bringing the solvent to the OH-ion concentration required for complete neutralization of the amino acid. To make the proper corrections for this factor the titration is carried out as follows:

"Sufficient standard alkali is added to a definite volume of the aqueous solution of the amino acid under investigation to give it a pH value of about 12.5. Then to an equal volume of water the same standard alkali is added in an amount sufficient to give it the same pH value, care being taken to add sufficient water to give the blank the same volume as that of the original at the pH value compared. Subtracting the cubic centimeters used in the blank from that required in the original gives the cubic centimeters of standard alkali necessary to neutralize the amino acid alone."

The neutralization curves for several amino acids determined in this way are given. These indicate in a striking manner the influence of the different groups in the molecule and bring to light certain inaccuracies in the formol titration method of Sörensen.

A new type of condenser for the determination of crude fiber, C. A. CLEMENS (*Jour. Indus. and Engin. Chem., 12 (1920), No. 3, pp. 288, 289, figs. 2*).—The condenser described consists of a glass bulb one side of which is blown in such a manner as to fit inside a lipless beaker. The lower surface of this projection is concave, thus offering a large surface for the condensation of the vapors in the beaker. In the top part of the bulb are sealed two glass tubes bent at right angles, one of them extending nearly to the bottom of the bulb. These serve as inlet and outlet tubes for a stream of cold water, several condensers being usually arranged in series.

The condenser, which may be used with lipless beakers ranging in size from 500 cc. to 1,000 cc., either tall or wide form, is said to offer even more advantages than the apparatus devised by Spears (E. S. R., 40, p. 410).

The acidimetry of red wines and fruit juices, A. M. MACMILLAN and A. TINGLE (*Jour. Indus. and Engin. Chem., 12 (1920), No. 3, pp. 274–276*).—The conditions under which red wines and fruit juices may be titrated by the spectroscopic method previously noted (E. S. R., 39, p. 503) are described, and the principles underlying spectroscopic titration and their application are discussed. Phenolphthalein in 1 per cent solution and methyl red in 0.05 per cent solution are recommended as suitable indicators for the spectroscopic method, the amount required varying with the color, depth, and total volume of the liquid.

The detection of methyl alcohol, H. Wolff (*Chem. Ztg., 43 (1919), No. 104, p. 555*).—Apomorphin in concentrated sulphuric acid is suggested as giving a more reliable and delicate test for methyl alcohol after oxidation than the reagents commonly used for color tests with formaldehyde. The blue-violet color produced is not formed by the aldehydes of the higher alcohols.

Methods for the quantitative determination of saccharin, O. Beyer (*Chem. Ztg., 43 (1919), No. 101, pp. 537, 538*).—This is a review, with references to the literature, of various methods of determining saccharin. The method of Richmond and Hill, previously noted (E. S. R., 41, p. 115), is recommended as accurate and time-saving.

The sanitary quality of milk as judged by the colorimetric hydrogen-ion determination, L. H. Cooledge and R. W. Wyant (*Michigan Sta. Quart. Bul., 2 (1920), No. 3, pp. 145, 146; also in Creamery and Milk Plant Mo., 9 (1920), No. 3, p. 38*).—A method of grading milk by means of colorimetric H-ion determinations is outlined briefly as follows: One-tenth cc. of the milk to be tested is placed in a tube of neutral broth containing bromthymol blue as an indicator and incubated at 37° C. Colorimetric readings are taken at one-hour intervals and the condition of the milk is judged by the rate at which the reaction changes.

It is stated that the poorest samples of milk may be picked out at the end of one hour and the best samples given their proper rating at the end of eight hours. Various advantages in the use of this method are pointed out and it is recommended as a valuable aid to city milk plants, condenseries, ice-cream factories, etc.

A similar method for testing milk has been previously described by Baker and Van Slyke (E. S. R., 42, p. 209).

Notes on double polarization methods for the determination of sucrose and a suggested new method, G. W. Rolfe and L. F. Hoyt (*Jour. Indus. and Engin. Chem., 12 (1920), No. 3, pp. 250–253*).—An investigation is reported of the possibility of using in the double polarization method for determining sucrose a substitute for hydrochloric acid which would invert so slowly at ordinary temperatures as to permit direct readings without error and yet be sufficiently acid to effect complete inversion on heating. Monochloracetic acid proved a satisfactory reagent, and the method developed involving its use is described as follows:

"Dissolve the normal weight of sample in a 100-cc. flask, clarify with an appropriate amount of lead acetate, make up to volume, and filter. Transfer 50 cc. of filtrate to a 100 cc. flask, add 15 cc. of a 20 per cent solution of monochloracetic acid, make up to volume with water, and polarize within 15 minutes after adding the acid. To invert, transfer about 50 cc. of the solution to a 50 cc. flask, stopper tightly by tying down the cork, and immerse flask in boiling water, maintaining active ebullition for 30 minutes, or for 60 minutes for low-grade products clarified with a large amount of lead acetate. Remove flask, and cool quickly to room temperature. Allow to stand at least 2 hours and polarize in a 200 mm. tube with thermometer."

The percentage of sucrose is calculated from the following formula:

$$S=\frac{2(a-b)}{141-\frac{t}{2}}\times 100$$

In this formula S=percentage of sugar, a=direct reading, b= invert reading and t=temperature. The solutions should be made and polarized at as nearly 20° C. as possible.

The principal advantages of this method are considered to be that both direct and invert readings are made on a solution of unchanged acidity and sugar concentration, a slight excess of basic lead acetate does not affect the inversion or produce troublesome precipitates, no error is introduced by making up to volume after inversion, and inverted solutions of low-grade products are lighter in color and easier to polarize than those inverted by the Herzfeld method. Comparative tests indicated that the method gives more accurate results than the Herzfeld method. The chief disadvantage is thought to be in the time required, but it is pointed out that the actual time required in manipulation is little if any more than that of the usual methods.

Contribution to the study of the titration method for determining blood alkalinity.—**Action of acids on protein solutions,** R. CLOGNE (*Compt. Rend. Soc. Biol.* [*Paris*], *82* (*1919*), *No. 29, pp. 1192, 1193*).—Determinations by titration of the alkalinity of egg albumin, beef blood, and beef serum after the addition of varying amounts of a standard acid, both in the cold and after heating on a water bath, are reported for the purpose of pointing out the influence of the protein content of such solutions on the alkalinity determinations. It is shown that the added acid combines not only with the alkali in the blood but also with the proteins, thus introducing a modifying factor in such determinations of blood alkalinity.

Determination of ammonia in blood by a volumetric method, P. GÉRARD (*Compt. Rend. Soc. Biol.* [*Paris*], *82* (*1919*), *No. 29, pp. 1186–1189*).—The method consists essentially in bubbling about 200 liters of air through a 10 cc. sample of oxalated blood treated with an equal volume of a 20 per cent solution of sodium or potassium carbonate, collecting the liberated ammonia in 2 cc. of N/100 H_2SO_4 diluted with about 5 cc. of distilled water, and titrating the excess of acid with N/100 base.

The method is said to require not longer than 1.5 hours for completion and to give results of a precision comparable with the methods commonly used, while being much simpler in material and technique.

Some observations on E. C. Kendall's method of estimating iodin in thyroid preparations, S. B. KUZIRIAN (*Proc. Iowa Acad. Sci., 25* (*1918*), *pp. 495, 496*).—The author, at the Iowa Experiment Station, reviews Kendall's method of estimating iodin in thyroid preparations, and discusses briefly certain details that must be followed to obtain satisfactory results in the determination of iodin in tankage, roughage, and other organic substances with a high percentage of ash. These include the use of more sodium hydroxid and less potassium nitrate in destroying the organic matter; the elimination of iron and other interfering elements by adding to the solution of the fused mass a few grams of sodium carbonate and some talc, boiling for a few minutes, setting aside for two hours, and filtering; and the complete elimination of bromin by the addition of a considerable excess of phosphoric acid and a prolonged boiling of the diluted filtrate.

The determination of cellulose in woods, W. H. DORE (*Jour. Indus. and Engin. Chem., 12* (*1920*), *No. 3, pp. 264–269, fig. 1*).—This contribution from the California Experiment Station reports a study of the effect of alkaline and of acid hydrolysis of wood previous to chlorination in the cellulose determination. The data reported indicate that all processes involving hydrolysis result in a diminished yield of both *x*-cellulose and total cellulose in practically the same ratio. It was found that the hemicelluloses, for the removal of which the preliminary hydrolytic treatment had been recommended, were hydrolyzed during the chlorination treatment and dissolved in the filtrates and washings. A part of the furfural-yielding material (probably xylan) was also hydrolyzed and dissolved during chlorination, while a considerable proportion (probably oxycellulose) was unaffected by any of the hydrolytic treatments and remained in the residue.

These findings have led to a modification of the methods previously described by the author in connection with the proximate analysis of wood (E. S. R., 41, p. 14). The preliminary hydrolytic process is now considered unnecessary and objectionable in that it has been found to involve a slight destruction of the cellulose.

Utilization of waste sulphite liquor, compiled by B. Johnsen and R. W. Hovey (*Dept. Int. Canada, Forestry Branch Bul. 66* (*1919*), *pp. 195*).—This is a review of the literature on the commercial utilization of waste sulphite liquor. The material has been arranged in chapters according to the nature of the recovered products, and each of the more important chapters is prefaced by a brief discussion of the subject treated. The products include binding materials, gums, adhesives and sizing materials, tanning materials, alcohol, fuel, feeding stuffs, fertilizers, dyes, sulphur, and miscellaneous substances.

Industries for the conservation of fruits.—Apples, C. Arnou (*Les Industries de la Conservation des Fruits. La Pomme. Paris: Author,* [*1919*], *pp. 122, figs. 42*).—This volume, which is one of a series on the commercial utilization and conservation of fruits, includes chapters on the manufacture of various products from apples, the preservation of the fruit by refrigeration and desiccation, and the utilization of by-products. Illustrations are given of the machinery employed in the various processes described.

Making grape juice, P. Thayer (*Mo. Bul. Ohio Sta., 4* (*1919*), *No. 8, pp. 249–252*).—The hot-pressed and cold-pressed processes described were adapted from methods outlined in Farmers' Bulletins 175 (E. S. R., 15, p. 154) and 644 (E. S. R., 32, p. 809) of the U. S. Department of Agriculture. In one case the grapes were crushed and heated to 65° C. (149° F.) before pressing and in the other they were simply crushed and pressed. The juice in both cases was heated to 80° before bottling and was then filtered through conical felt filters, bottled. and heated at 75°. By thus heating the juice before filtering to a higher degree than after bottling, the production of sediment in the bottles is said to be avoided.

As a rule the hot-pressed juice resembled the fresh fruit in color while in most cases the cold-pressed juice was of a lighter or different color, that from blue grapes being usually red, and that from red grapes pink or even colorless. The cold-pressed juice was always as sweet and in some cases sweeter than the hot-pressed juice.

Notes on the results with various varieties are tabulated.

Varieties of grapes for juice, P. Thayer (*Mo. Bul. Ohio Sta., 4* (*1919*), *No. 8, pp. 253–260*).—A study is reported of the value for juice production of the more important varieties of grapes grown in the station variety vineyard. In 1917, 66 lots of grape juice totaling 262 bottles were made from 33 different varieties of grapes, and in 1918, 76 lots totaling 248 bottles from 34 varieties. The juices were prepared without the addition of sugar or water by both the methods outlined in the above article, and were tested both alone and in various combinations for attractiveness of appearance and flavor, and for the percentage dilution and amount of sugar required per 100 cc. of the undiluted juice to secure the greatest palatability. The results are reported in a table in which are included the Brix readings for the specific gravity of the juice.

In general the juices made from blue grapes by either process were attractive, those prepared from red grapes by the hot process were more attractive than the cold pressed juices, and the juices of white varieties were, with few exceptions, unattractive by themselves. By combining different juices it was found possible to overcome the individual faults of the separate juices and to make an almost endless variety of juices of different colors and flavors. The principal possibilities in blending are considered to be the creation of new flavors, the correction of acidity or poor color, the amelioration of acidity, and the utilization of unattractive juices. Suggestions are given for such combinations among the juices tested.

Every step in canning, G. V. Gray (*Chicago: Forbes & Co., 1919, pp. 253*).—This volume contains detailed directions for canning fruits, vegetables, meat, and fish by the cold-pack method; making jellies and fruit preserves; drying fruits and vegetables; curing, smoking, and preserving meat; preserving eggs; storing vegetables in the home; and marketing home-canned produce. A chapter entitled Why Canned Goods Spoil explains the causes of unfavorable results sometimes experienced by the beginner in using the cold-pack method, and gives directions for avoiding such failures.

Temperature-time relations in canned foods during sterilization, G. E. Thompson (*Proc. Iowa Acad. Sci., 25 (1918), pp. 39–48, figs. 6*).—Essentially noted from another source (E. S. R., 41, p. 209).

METEOROLOGY.

A statistical study of weather factors affecting the yield of winter wheat in Ohio, T. A. Blair (*U. S. Mo. Weather Rev., 47 (1919), No. 12, pp. 841–847, figs. 2*).—In this paper "the statistical method is applied to the problem of determining what are the important weather factors affecting the growth of winter wheat in Ohio, and their relative importance. The results are expressed as partial correlation coefficients and in linear regression equations of the form,

$$Y=a+b_1x_1+b_2x_2+b_3x_3+b_4x_4+\ \ldots\ldots,$$

in which the coefficients are evaluated by least square methods." In this equation "Y is the yield; x_1, x_2, x_3, x_4, ... are the various weather elements, such as mean temperature, total precipitation, percentage of sunshine, expressed numerically; a. b_1, b_2, b_3. b_4, ... are numerical quantities having a constant value for a given equation, to be determined from the data. . . .

"Because of the difficulty of securing extensive data for other weather elements, it is necessary to deal chiefly with temperature and precipitation values. In general, it is to be expected, because of the relatively large and well-distributed rainfall of Ohio. that temperature variations will have more influence than precipitation variations upon the yield. For the State as a whole, correlations of monthly weather values with the 'condition' reports of the Bureau of Crop Estimates and with the reported yields show no very close relationships. The correlations with condition give a general indication that a wet autumn, a warm and dry winter and spring, especially a warm March. and a cool and wet May are the most favorable weather conditions. Yield correlations suggest a warm March and June and a cool and dry May as the only important requisites for a good yield. In Fulton County in northwestern Ohio, and in three counties in the central part of the State, certain 10-day periods in April, May, and June are found to exert a more effective influence on the yield than all other weather conditions combined, except that in Fulton County the March snowfall is also an important factor. It is weather conditions during these 10-day periods, especially temperature conditions, that largely determine yield. These periods are connected especially with the jointing, heading, and filling stages in the growth of the plant. . . . Because of the large influence of late May and June temperatures, earlier forecasts of yield can be of little value."

Relation of the weather to the yield of wheat in Manitoba, A. J. Connor (*Canada Census and Statis. Off., Mo. Bul. Agr. Statis., 11 (1918), No. 116, pp. 115–125, fig. 1; extract in U. S. Mo. Weather Rev., 47 (1919), No. 12, p. 848*).—This article is based on simultaneous observations at various experiment stations, on temperature, precipitation, and other meteorological conditions, and on dates of sowing, appearance above ground, stooling, stem roots, heading, flowering, milk-stage, maturity, and harvesting of wheat, as well as on the average height of the plants every seven days.

"There appeared to be a relation between the length of the period from sowing to heading, or from the appearance of the plants to heading, and the subsequent yield, the longer periods being positively related to the greater yields. . . .

"From the results so far attained it is not educible that there is a critical period of short duration." During the latter part of the 90-day period after sowing, however, there will ordinarily be increased probability of heat and drought in Manitoba, and if during this period "the weather be warm, dry, with great temperature range, the wheat plants will head early and the harvest will be light; but if the cool and moist conditions continue, heading will be postponed and the yield increased. . . . The variability of early July weather may be regarded as the critical factor in wheat production in Manitoba."

It was found that the rainfall, mean daily minimum temperature, and mean daily range of temperature during the third 30 days after sowing are to some extent intercorrelated. "The minimum is slightly and the rainfall to a much greater degree correlated with the range, both negatively, while there is no relation between the minimum and the rain. Since the rainfall is related positively and the other factors negatively to the yield of wheat, the quotient $\frac{\text{Rain}}{\text{Range} \times \text{minimum}}$ should be related positively. The plotting of these quotients against the yields led to the following equation: If Y be the yield in bushels per acre, m the mean minimum temperature, p the total precipitation for 30 days, r the mean daily range m^1—40), then

$$Y=0.434\left(m-\frac{r}{2}\right)\log\frac{1000_p}{rm'}$$

If the mean daily temperature be denoted by t, then the quantity $\left(m-\frac{r}{2}\right)$ may be written $(t-r)$."

The dependence of the chemical composition, especially the starch content, of the wheat upon weather changes has also been studied with a view to proving or disproving the hypothesis "that the total starch content of the grain varies directly as the amount of water transpired by the plant from heading to maturity . . . [and] that the factors favorable to starchy grain are a moist soil with bright sunshine, low humidity, high temperature, and drying winds." The study has not proceeded far enough to warrant conclusions.

Cultivation does not increase the rainfall, J. W. Smith (*U. S. Mo. Weather Rev., 47 (1919), No. 12, pp. 858–860, figs. 2*).—This is a paper presented at a joint meeting of the American Meteorological Society and Association of American Geographers, St. Louis, Mo., December 31, 1919.

Data are presented from which the conclusion is drawn that "cultivation does not increase the rainfall in the semiarid region. There are well-defined sequences of increasing and decreasing annual rainfall amounts, but there has been no progressive increase or decrease during the past 50 years. It is not possible to predict the approximate precipitation for any year from past records."

Australian droughts, C. RICHARDSON (*U. S. Mo. Weather Rev., 47 (1919), No. 12, p. 860*).—The relation of air currents to these droughts is discussed.

The distribution of maximum floods, A. J. HENRY (*U. S. Mo. Weather Rev., 47 (1919), No. 12, pp. 861–866*).—This is a paper read before the American Meteorological Society at New York, January 3, 1920. The conclusions reached are summarized as follows:

"The records of both American and European rivers show an average of 7 to 10 great floods per century. Great floods are primarily due to precipitation, and that precipitation, in the form of rain, which produces floods may be of two distinct types, (1) so intense and widely distributed as to produce flooding regardless of antecedent conditions, (2) moderate rains continued intermittently for 8 to 10 days or more with antecedent conditions favorable to a high run-off. There does not appear to be an orderly progression in the magnitude of floods with the lapse of years; that is to say, the absolute maximum flood of any 100-year period is not necessarily greater than the absolute maximum flood for the preceding 100 years. The magnitude of great floods with respect to the average annual flood seems to increase in a geometrical progression, but apparently wholly regardless of the flow of time. Great floods, like great rainfalls, are essentially a local phenomenon even for the same stream."

Evaporative capacity, R. E. HORTON (*Abs. in U. S. Mo. Weather Rev., 47 (1919), No. 12, p. 856*).—This is an abstract of a paper presented before the American Meteorological Society at New York, January 3, 1920.

"The object of this paper is to furnish data showing the relative evaporation rates under standard conditions at different localities throughout the United States. The term 'evaporative capacity' is defined by the author as: 'The maximum rate of evaporation which can be produced by a given atmospheric environment from a unit area of wet surface exposed parallel with the wind, the surface having at all times a temperature exactly equal to that of the surrounding air.'

"The evaporative capacity of 112 U. S. Weather Bureau stations has been determined from the meteorological normals of temperature, wind velocity, and humidity, by means of the author's evaporation formula. The coefficients in the evaporation formula were determined by experiments covering two years on a standard Weather Bureau evaporation pan. Maps are given showing evaporative capacities for day and night and summer and winter conditions, and tables are given showing monthly evaporative capacities and day and night time temperatures for each of the 112 stations. The application of the maps and data to problems in hydrology, water consumption by plants, and agriculture is discussed."

Variations in the total and luminous solar radiation with geographical position in the United States, H. H. KIMBALL (*U. S. Mo. Weather Rev., 47 (1919), No. 11, pp. 769–793, pl. 1, figs. 22*).—This is a rather exhaustive summary of investigations carried on by the author for a number of years, the purpose of which is "to determine as accurately as possible with the data available, (1) the variation in direct solar radiation intensities with latitude, (2) the increase in intensity as we go westward from the Atlantic coast districts to the drier and more elevated central plains, (3) the total radiation received on a horizontal surface (direct solar, plus diffuse radiation from the sky), and (4) to reduce the total, or heat radiation as thus determined along certain parallels of latitude to luminous, or daylight intensity. There have been utilized in this investigation the radiation measurements made at Washington, D. C., since 1905; at Madison, Wis., since 1910; at Santa Fe, N. Mex., since 1912; and at Lincoln, Nebr., since 1915; and the measurements of the total solar, or heat radiation, and of luminous solar radiation or daylight illumination, made at Mount Weather, Va., during 1913 and 1914."

"Most of the results are shown in both tables and charts, the latter consisting of isopleths of heat or of luminous solar radiation, with hour angles of the sun as ordinates and days of the successive months as abscissas, except that the daily totals of radiation on a horizontal surface on the twenty-first of each month are shown by means of radiation isograms on outline maps of the United States. The effect of surface slope on solar radiation intensities is briefly considered."

Thermal belts and inversions of temperature in the North Carolina mountain region, H. J. Cox (*Abs. in U. S. Mo. Weather Rev., 47 (1919), No. 12, pp. 879, 880*).—This is the author's abstract of a paper presented at a joint meeting of the American Meteorological Society and Association of American Geographers, St. Louis, Mo., December 31, 1919. The paper is based upon observations at 16 places in the mountain region of North Carolina, from 1912 to 1916, inclusive.

The observations were made at the different places under varying conditions of topography, on valley floor, slope, and summit, for the purpose of more clearly defining, if possible, the so-called thermal belts. The results throw light on the location, cause, and extent of these thermal belts. The results indicate that cold valley bottoms as well as cold mountain tops are normal. The warmest thermal belts between these two extremes are found where the mountain mass is small, the slope steep, and the opposite valley wall not close. "The higher temperatures on the slopes and certain summits in the Carolina mountain region are favorable for fruit growing in so far as the absence of frost is concerned, as compared with the valley floors, but considerable injury often occurs from freezes in the winter and early spring in the upper and middle levels after protracted heated periods and growing weather which had served to swell the buds."

Predicting minimum temperatures, J. W. Smith (*Abs. in U. S. Mo. Weather Rev., 47 (1919), No. 12, pp. 848, 849*).—This is "a mathematical discussion of the relation between the relative humidity in the late afternoon and the variation of the minimum temperature during the coming night from the afternoon dewpoint temperature, when radiation conditions prevail.

"The study shows that there is a well-defined relation which can be expressed by the curve for a parabola. . . . The equation used is written $v=x+by+cz$, in which v is the variation of the minimum temperature from the evening dewpoint; b is the evening relative humidity, and c is the square of the relative humidity; x, y, and z are the three unknowns, which are evaluated from three normal equations which are readily written by the star point method after the data have been properly charted. The results are remarkably accurate. The studies show that the minimum temperature can be closely predicted in the orchard at considerable distance from the observing station; that the hygrometric observations made at noon may be used quite as well in some instances as those made in the evening, and that the equation will sometimes apply as well to cloudy as to clear nights."

Evidence of climatic effect in the annual rings of trees, A. E. Douglass (*Abs. in U. S. Mo. Weather Rev., 47 (1919), No. 12, p. 881*).—This is the author's abstract of a paper presented before the American Metreorological Society at St. Louis, Mo., December 30, 1919. A more detailed account of the same study has been noted (E. S. R., 42, p. 417).

Monthly Weather Review (*U. S. Mo. Weather Rev., 47 (1919), Nos. 11, pp. 769–840, pls. 15, figs. 37; 12, pp. 841–911, pls. 17, figs. 10*).—In addition to detailed summaries of meteorological, climatological, and seismological data and weather conditions for November and December, 1919, and bibliographical information, reprints, reviews, abstracts, and minor notes, these numbers contain the following contributions:

No. 11.—Variations in the Total and Luminous Solar Radiation with Geographical Position in the United States (illus.), by H. H. Kimball (see p. 618); Bibliographic Note on Sunshine in the United States, by R. DeC. Ward; A New Instrument for Measuring Sky Radiation (illus.), by A. Ångström; Some Problems Relating to the Scattered Radiation from the Sky (illus.), by A. Ångström; Note on Comparisons Between Pyrheliometers and on the Difference Between the Ångström Standard and the Smithsonian Standard, by A. Ångström; Parade-ground Temperatures at College Station, Tex., by C. F. Brooks; Temperatures in New York Subways (illus.); Forecasting Tide Stages in the Harbor at Portland, Oreg. (illus.), by E. L. Wells; and The Virginia Earthquake of September 5, 1919, by E. W. Woolard.

No. 12.—A Statistical Study of Weather Factors Affecting the Yield of Winter Wheat in Ohio (illus.), by T. A. Blair (see p. 616); Predicting Minimum Temperatures, by J. W. Smith (see p. 619); The Work of the U. S. Weather Bureau in the West Indies, by O. L. Fassig; Aerological Work in the U. S. Navy, by C. N. Keyser; New Form of British Daily Weather Report; International Meteorological Committee Meeting in London, July, 1919; Note on High Free-air Wind Velocities Observed December 16 and 17, 1919 (illus.), by W. R. Gregg; Evaporative Capacity, by R. E. Horton (see p. 618); Device for Obtaining Maximum and Minimum Water Surface Temperatures (illus.), by R. E. Horton; Cultivation Does Not Increase the Rainfall (illus.), by J. W. Smith (see p. 617); Australian Droughts, by C. Richardson (see p. 618); The Distribution of Maximum Floods, by A. J. Henry (see p. 618); and Determination of Meteorological Corrections on the Ranges of Guns (illus.), by W. Noll.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 6* (*1919*), *Nos. 9, pp.* [*204*], *pls. 4, figs. 2; 10, pp.* [*202*], *pls. 4, figs. 2*).—These volumes contain brief summaries and detailed tabular statements of climatological data for each State for September and October, 1919, respectively.

SOILS—FERTILIZERS.

Relation of the moisture equivalent of soils to the moisture properties under field conditions of irrigation, S. T. Harding (*Soil Sci., 8* (*1919*), *No. 4, pp. 303–312, figs. 6*).—Attention is called to the need for some criterion which will furnish an index of the soil moisture properties in studies of the water requirements of soils under irrigation. In this connection, a comparison of the moisture equivalent with the critical moisture points of soils under the actual field conditions of irrigation practice, is reported. This is based on data secured by the author in the course of various field investigations of the water requirements of soils and their irrigation practice, conducted under the supervision of the Irrigation Investigations of the Bureau of Public Roads, U. S. Department of Agriculture, and the University of California.

The general field method used was to take soil moisture samples before and after irrigation in order to determine the amount of water retained by the soils. The data were secured from a wide range of soils under varying conditions of practice, including about 9,200 individual moisture determinations from soils in Montana, Idaho, Washington, Nevada, and California, and about 300 moisture equivalent determinations made from 1913 to 1918, inclusive. Comparisons of four moisture conditions were made for the surface foot of soil and for the average of the upper 5 ft. of soil, these corresponding to the maximum field capacities, the normal field capacity, the usual moisture before irrigation, and the wilting of the crop.

The data presented are thought to warrant the general conclusion that there is a fairly consistent relationship between the moisture equivalent and the various moisture properties of soils, which appears to offer promise of usefulness in determining moisture properties and probable irrigation practice of soils whose irrigation is contemplated, particularly as to the probable depth of water which will be retained from an irrigation with its effect on the depth to be applied and the necessary frequency of application. The data presented, while indicating the general nature of the relationship of soil moisture capacity and soil texture, are not sufficient to fix the numerical values of such relationships except in a very general way. The relationship of the soil-moisture properties to the moisture equivalent does not appear to be linear except in the case of the wilting of the crop. The maximum depth of water per foot depth of soil which can be retained under favorable conditions for the upper 5 ft. of soil is about 1.25 in., which indicates that depths of a single irrigation in excess of 6 to 8 in., even under favorable soil conditions, will not be retained in the upper 5 or 6 ft. of soil. This conclusion is in accord with the results of general field observations from many sources.

Experiments on soil moisture, G. M. Grantham and M. M. McCool (*Michigan Sta. Quart. Bul., 2 (1920), No. 3, pp. 142–144*).—The results of experiments covering a period of three years on tillage and moisture control on a deep, medium sandy soil, growing potatoes, corn, and radishes with and without a soil mulch, are reported.

The portions of the field that were not mulched were scraped with a hoe to eradicate the weeds. The mulched portions were cultivated 3 in. deep. It was found that the differences in the amount of water lost from the unmulched plat and the one mulched with 3 in. of soil were negligible, while changes in the water content of the soil beneath a layer of muck were appreciably less than in the others. The results on the whole suggested that tillage conserves moisture mainly by the eradication of weeds and grass, and that the importance of the soil mulch in this connection has been somewhat overemphasized.

Adsorptive unsaturated soils, D. J. Hissink (*Adsorptief Onverzadigde Gronden. Delft, Netherlands: Technol. Gezelschap, [1918], pp. [1]+129–148*).—The author discusses the so-called adsorptively unsaturated soils occurring in humid climates, which are apparently the result of constant cropping and the leaching effect of rain followed by drying. Basic material must be supplied to and retained by such soils, and it is thought that liming is the best treatment. It is considered that the influence of liming on the adsorptive power of soils for basic material is one of the chief causes of its importance.

Calcium and magnesium content of virgin and cultivated soils, J. W. Ames and C. J. Schollenberger (*Soil Sci., 8 (1919), No. 4, pp. 323–335*).—The results of determinations of the contents of and relationships existing between total and fifth-normal nitric acid soluble calcium and magnesium, carbonate, and the reaction of both virgin and cultivated soils from 23 locations in Ohio, are reported, as conducted by the Ohio Experiment Station. The soils were sampled from two depths, 0 to 7 in. and 7 to 15 in.

The data indicate that in most virgin soils there is a concentration of readily soluble calcium and magnesium at the surface. With cultivated soils, however, the subsoil is usually better supplied with these elements than the surface soil. Certain interesting relationships between the proportion of the total calcium and magnesium which are soluble and the carbonate content and reaction are pointed out. These are summarized in the statement that when the proportion of the total bases (calcium and magnesium together) which are soluble is high, the soil is very likely to contain more carbonate or to be more basic to tests than is the case with similar soils having a less proportion of these bases soluble. Moreover, this is true for soils containing very small amounts, as well as those better supplied with carbonates.

A list of references to literature bearing on the subject is included.

The mixing of mineral soils and moor soils, G. RITTER (*Fühling's Landw. Ztg., 67 (1918), No. 1-2, pp. 16-31*).—Vegetation experiments and studies of nitrification and nitrogen fixation in mixtures of loamy sand soils and moor soils are reported. The purpose is to show the advantages to either soil of such a mixture with reference to physical and chemical condition.

It was found that the addition of virgin moor soil or peat litter to a light mineral soil increased the nitrate content, also the nitrate content of an upland moor soil was increased following an intermixture of lime and good mineral soil. It is concluded that the physical, chemical, and biological properties of an upland moor soil or a light mineral soil may be improved by mixing these two soil types.

Sugar-cane soils in the division of Demak, C. J. VAN LOOKEREN CAMPAGNE (*Arch. Suikerindus. Nederland. Indië, 1918, Jubileumnnum, pp. 34-39*).—The sugar-cane soils of the division of Demak in the Samarang residency in central Java are discussed with reference to their origin and physical and chemical composition. These soils have been formed from weathered products of andesite and basalt in connection with lava and ashes of recent volcanic origin. Mechanical analyses show that the greatest part of the soil particles are smaller than $\frac{1}{20}$ mm.

Bacteriological effects of green manure, II, C. F. BRISCOE and H. H. HARNED (*Mississippi Sta. Bul. 185 (1918), pp. 3-18, figs. 8*).—This is a progress report on experiments begun in 1913 (E. S. R., 32, p. 721), to determine the effect of microorganisms in the fermenting of green manures and particularly the advantage of a light dressing of stable manure as compared with that of a bacterial culture in the utilization of these green manures for plant food. The work included bacteriological and vegetative tests. The soil used was a mixture of sandy silt and sandy loam soil and was deficient in plant nutrients. The green manures added were alfalfa, oats, and cowpeas.

It was found that there was a direct relation between the bacterial count and the amount of organic matter added. The results of the vegetative tests and the bacteriological tests agreed closely. A light dressing of stable manure or the addition of a bacterial culture with a green manure gave a marked increase in the crop when 4 tons of the green manure were added. When 8 tons were added the effect was practically neutral, and when 16 tons were added a depressing effect was noted from the addition of the organisms contained either in the manure or in the bacterial culture. This phase of the work is to receive further attention.

The nitrogen content of the oat crop varied with the amount of crop produced, but not in direct proportion. The accumulative effect of green manure was marked, showing a uniform increase through the various treatments and continued effect in the following years. Where dry oats and vetch straw was turned under it was found that amounts as large as 16 tons were readily utilized and produced a crop 3.2 times that from untreated soil. Eight tons of the straw produced a larger crop than 20 tons of horse manure. The proportions were about one part oats and two parts vetch straw, and the horse manure was applied with and without lime. It was also noted that where large amounts of the oats straw were used together with horse manure or with a bacterial culture, or both, a depressing effect was brought about.

Studies on the synthesis of nitrogenous fertilizers (on the reactions $N+O$, $N+H$, NH^3+O, and on the transformation of cyanamid into ammonium sulphate), H. ALBRAND (*Rev. Prod. Chim.* [*Paris*], *22* (*1919*), *Nos. 14, pp. 367–371; 15, pp. 395–398, figs. 7; abs. in Chem. Abs., 13* (*1919*), *No. 21, pp. 2721, 2722*).—A review is given of the various methods of fixing nitrogen. The processes discussed are the Birkeland and Eyde, Hausser, Kilburn-Scott, Schonherr, Haber, cyanamid, ammonia by the cyanamid process, nitric acid by the Oswald reaction, transformation of the cyanamid into ammonium sulphate, and the arc process. Details of the methods are given, as well as the production by various countries.

The relation of certain acidic to basic constituents of the soil affected by ammonium sulphate and nitrate of soda, L. P. HOWARD (*Soil Sci.*, *8* (*1919*), *No. 4, pp. 313–321*).—A study of the relation of acids to bases in soils to a depth of from 7 to 8 in., as conducted at the Rhode Island Experiment Station, are reported. The soils had received like treatment for the past 25 years, except that one series was supplied with nitrogen in the form of sodium nitrate while the other was supplied with nitrogen in the form of ammonium sulphate.

It was found that great variations in acidity existed between the soils receiving sodium nitrate, as compared with those receiving ammonium sulphate. The soil acidity could not be correctly measured by reagents which reacted only with the acidic ingredients. Digestion with hydrochloric acid showed that great variations existed between the quotient obtained by dividing the oxids of aluminum and iron by those of calcium and magnesium. It ranged from 85, in the case of the unlimed soil receiving ammonium sulphate, to 10 where lime and nitrate of soda were employed.

A subsequent extract with ammonium hydroxid showed no great variation in this ratio of weak to strong bases. An exchange of bases, produced by treatment of the soil with a solution of potassium chlorid, showed a marked degree of reserve acidity from the unlimed soil receiving ammonium sulphate. The acidity so developed showed a correlation to the acidity of an aluminum salt equivalent in amount to the weight of aluminum which was contained in the solution obtained by shaking with potassium chlorid. In the acid unlimed soils, iron, and aluminum partially took the places occupied by calcium and magnesium in the limed soils. The soil solution acted as a buffer solution containing phosphates and carbonates. The concentration of hydrogen ions in the soil solution from the unlimed plat receiving ammonium sulphate was very similar to that produced by the addition of even quite large amounts of aluminum salts to buffer solutions.

It is concluded that "the 'acidity' in a soil caused by long-continued use of ammonium sulphate is the result of a change in the ratio of acids to bases. The position normally occupied by the stronger bases, such as calcium and magnesium, has been taken by weaker bases, such as iron and aluminum. The neutrality of the soil solution can no longer be maintained, since salts of these weak bases dissociate. Free acid resulting from this dissociation is accompanied by a definite concentration of hydrogen ions."

A list of 12 references to literature bearing on the subject is included.

Upland moor cultivation without sodium nitrate, E. GULLY (*Landw. Jahrb. Bayern*, *8* (*1918*), *No. 3, pp. 126–154*).—Three years' experiments with potatoes on upland moor soils, using sodium nitrate with each of calcium carbonate and two different types of by-product lime, are reported. The lime was applied in amounts of 890, 1,780, and 3,560 lbs. per acre.

It was found that potatoes are able to withdraw considerable quantities of soil nitrogen from upland moor soils over 2 and 3 year periods. The use of calcium carbonate on this soil hindered the assimilation of nitrate nitrogen somewhat. This was more marked in the third year than in the second. It is concluded that where nitrate nitrogen is used on upland moor soils it is not advisable to make the heavy applications of lime which are customary on German soils. The by-product limes gave better results in this respect, however, than the pure calcium carbonate. It is concluded further that such lime should not be applied in amounts exceeding the equivalent of 1,780 lbs. of calcium oxid per acre.

Three years' experiments with ammonium sulphate and liming, using the same types of lime on upland moor soils, gave very poor results with potatoes. It is recommended that where ammonia nitrogen is used, in order to insure a profit with potatoes, additions of phonolite or calcium carbonate be made at the beginning of cultivation. Neither on newly broken upland moor soil nor on second-year soil was fertilization with ammonium sulphate satisfactory, it being found that the ammonia nitrogen was not completely utilized. It was also found that calcium carbonate and phonolite gave about equal results in increasing the yield of potatoes where ammonium sulphate was used. Lime nitrogen gave better results on newly broken upland moor soils without liming than ammonium sulphate. In dry years, however, lime nitrogen alone and in combination with calcium carbonate gave unsatisfactory results. Ammonium sulphate on the other hand gave satisfactory results when accompanied by calcium carbonate. The action of lime nitrogen was improved where by-product lime was applied previous to cultivation in amounts equivalent to 1,068 lbs. of calcium oxid per acre.

Results of further nitrogen experiments, Schneidewind (*Landw. Wchnschr. Sachsen, 20* (*1918*), *Nos. 16, pp. 153–155; 17, pp. 161–163*).—Experiments with various crops on different soils are reported.

It was found that potash ammonium nitrate gave as good results as sodium nitrate when used as a top-dressing. Similar results were obtained with sodammonium nitrate, and it is concluded that both of these forms of nitrogen may be used as a substitute for sodium nitrate. Ammonium chlorid, urea, and urea nitrate gave as good results as ammonium sulphate, and lime nitrogen almost as good. None of these forms of nitrogen were as successful as sodium nitrate. Urea gave poorer results as a top-dressing than any of the other types. Ammonium chlorid depressed the starch content of potatoes.

The best results were obtained with beets and other summer crops when all the forms of nitrogen used were added before planting. It was further found that on deep rich soils nitrogenous fertilizers can be safely applied in the fall, but that on light permeable soils the least loss results and the best results are obtained when they are applied as top-dressings in the spring. Lime nitrogen gave the best results with summer crops when added before planting. The use of lime nitrogen in grain form is not recommended.

Potassium-bearing minerals as a source of potassium for plant growth, E. De Turk (*Soil Sci., 8* (*1919*), *No. 4, pp. 269–301*).—It is pointed out that there are quite large areas of soils in Illinois and other States which are markedly deficient in potassium. These consist mainly of muck and deep peat soils, and light sandy soils. Attention is called to the abundance of potash-bearing minerals in the United States, and experiments are reported which were conducted at the Illinois Experiment Station (1) to determine to what extent the potassium in certain minerals will become available when mixed with peat soil, using both the growth of a crop and chemical analysis as a measure of the amount of soluble potassium, and (2) to determine the effect of certain more active organic materials and soluble salts upon the solubility of the potassium in those minerals. A review of previous investigations by others, bearing on the subject, is given, and the nature and significance of the silicate minerals are considered with reference to their formation, composition, and structure.

In the experiments, the soil used was a very loose peat, quite free from sand and plant residues. The minerals selected for study were orthoclase feldspar, microcline, leucite rock, alunite, muscovite, and lepidolite. The organic materials used were bright clean alfalfa hay, finely ground; clean prairie hay, consisting mainly of blades, finely ground; and fresh cow manure, without litter, carefully dried at low temperature and ground.

It was found that the use of finely ground potassium-bearing minerals increased the yield of buckwheat in peat soil from 21 to 34.8 per cent. Lepidolite was detrimental to the growth of buckwheat, especially if present in large amounts. The addition of crop residues, manure, or soluble sodium or magnesium salts to peat soil, together with the minerals used in this experiment, did not increase the yield of crop or the availability of the mineral potassium. The so-called feeding power of the plant itself, through the activities of the root system, was an important factor in the utilization of relatively insoluble potassium.

The solubility of the minerals used, as determined by extraction with water, was very low, except that of lepidolite. It was increased by ammonium chlorid and also by the decomposition of alfalfa. The result in the latter case may be due to ammonification of the nitrogenous compounds in the alfalfa.

All the minerals used have the ability to absorb considerable amounts of potassium from solution. The absorption is probably physical to a large extent.

The low availability of the potassium of dune sand was due to the fact that most of the potassium is contained in the larger particles. The relatively small surface of the particles is considered sufficient explanation of the low solubility of the potassium contained in them. The increase in solubility of the potassium in such sands produced by grinding, however, was not sufficient to be of practical value.

It is stated that the results of the crop culture work should not be considered conclusive, but that they should be verified by repetition for several seasons with various other farm crops. A list of 69 references to the works of others, bearing on the subject, is included.

A field comparison of hydrated lime with limestone of different degrees of fineness, B. L. Hartwell and S. C. Damon (*Rhode Island Sta. Bul. 180* (*1919*), *pp. 4–18, figs. 4*).—Six years' experiments made to compare a high magnesium slaked or hydrated lime and a 10-mesh ground limestone from the same original rock are reported. The following siftings from the limestone also entered into the comparison: Ten to 20 mesh, 20 to 40, 40 to 80, and all finer than 80 mesh. The crops grown each year were mangels, carrots, alfalfa, and barley. The additions were made on the basis of equivalent acid neutralizing value. During the first season the 80-mesh limestone had the same effect on growth as the hydrated lime, and the percentage of this grade in the 10-mesh limestone was a measure of the efficiency of the calcium oxid equivalent of the unsifted limestone for the crop immediately following its application.

It was found that where lime is much needed, about two and one-half times as much ground limestone by weight, depending upon its fineness, was required to exert the same effect as hydrated lime. The effect of the 10-mesh limestone during the third, fourth, and fifth year after application was greater than the equivalent amount of hydrated lime, but the greater activity of the latter in the first years placed the average slightly in favor of the hydrated lime. It is stated that a selection from these two kinds of lime should depend mainly on the relative cost per calcium oxid equivalent, delivered on the land. Increasing costs of transportation and containers tend to place the advantage with the material having the higher analysis.

[Fertilizers], F. A. López Domínguez (*Ann. Rpt. Insular Expt. Sta., Dept. Agr. and Labor, Porto Rico, 1919, pp. 21-23*).—It is stated that a total of 131 samples of mixed fertilizers and fertilizing materials, representing every brand offered for sale in Porto Rico during the fiscal year 1918-19, were analyzed, of which 104 were taken officially. Of the official samples, 20 per cent were found to be below the guaranty, which was a decided improvement over the previous year.

Analyses of 25 samples of guanos showed the maximum content of nitrogen as ammonia to be 4.76 per cent and the minimum 0.1 per cent. The percentages of potash were still lower, the maximum being 1.11 per cent and the average 0.46 per cent. One sample contained no potash. These guanos are said to be chiefly valuable for the phosphoric acid content. The highest phosphoric acid content found was 21.6 per cent, the lowest 2 per cent, and the average 9.4 per cent.

AGRICULTURAL BOTANY.

Plant physiology, H. Molisch (*Pflanzenphysiologie. Leipsig and Berlin: B. G. Teubner, 1917, pp. [4]+102, figs. 63*).—This is No. 569 of the Aus Natur und Geisteswelt series.

Relation of moisture in solid substrata to physiological salt balance for plants and to the relative plant-producing value of various salt proportions, J. W. Shive (*Jour. Agr. Research [U. S.], 18 (1920), No. 7, pp. 357-378, figs. 7*).—This is a report of studies carried on at the New Jersey Experiment Stations on the influence of different degrees of moisture in solid substrata upon the physiological salt balance for young wheat plants and upon the relative plant-producing value of various salt proportions. Tests were made in sand cultures with 36 sets of salt proportions of the three salts monobasic potassium phosphate, calcium nitrate, and magnesium sulphate, and with three different degrees of moisture.

It was found, under the conditions of the experiment, that the physiological balance of the nutrient solutions producing the best yields of wheat tops and roots was not altered by variations in the moisture content of the solid substratum to which the solutions were applied. The physiological balance of salt proportions which was best with the lowest moisture content was also best with the medium and the highest degree of moisture. It is claimed that good physiological balance and optimum total concentration of a nutrient solution for plants is not alone sufficient to produce the best growth of which the solution is capable when it is diffused as a film on the particles of a solid substratum. A medium degree of moisture which was approximately optimum for the substratum used was found to be correlated with the highest yields of tops and roots, high transpiration rates, and medium water requirement rations.

Effect of lime upon the sodium chlorid tolerance of wheat seedlings, J. A. LeClerc and J. F. Breazeale (*Jour. Agr. Research [U. S.], 18 (1920), No. 7, pp. 347-356, pls. 10*).—In continuation of work previously reported (E. S. R., 27, p. 130), an account is given of investigations carried on cooperatively between the Bureau of Chemistry and the Bureau of Plant Industry of this Department, to determine the effect of lime upon some of the common salts occurring in alkali soils.

In these experiments, wheat seedlings were grown in solutions containing varying proportions of sodium chlorid, and it was found that the higher tolerance to alkali salts shown by plants in soil and sand than by those grown in water cultures is not due entirely to the physical effect of the presence of solid particles of different degrees of fineness, but also to certain soluble substances which are sometimes present in very small quantities. Calcium oxid and calcium sulphate were found to overcome the toxic effects of sodium chlorid and sodium sulphate. Magnesium sulphate and barium chlorid were slightly antagonistic to sodium chlorid, while potassium chlorid, sodium nitrate, sodium phosphate, ferric chlorid, and alum had no effect on the toxicity of sodium chlorid. Under the circumstances of the experiments, the presence of lime did not prevent the entrance of sodium chlorid and sodium sulphate into the plant cells. The antagonistic effects of lime are considered to be due not to its effect on the permeability of the cells but to some other cause.

On chlorophyll, carotin, and xanthophyll, and on the production of sugar from formaldehyde, A. J. Ewart (*Proc. Roy. Soc. Victoria, n. ser., 30 (1918), No. 2, pp. 178–209*).—Giving an account of work subsequent to that previously noted (E. S. R., 34, p. 30), the author states that in the assimilation of carbon dioxid chlorophyll acts as a light energizing enzym and takes direct part in the cycle of chemical changes. These changes probably have carotin, xanthophyll, phytyl, and glaucophyllins as intermediate products and glucose, levulose, formaldehyde, and oxygen as end products, the sugar being formed directly as well as through the polymerization of formaldehyde. A large part of the energy represented by the carbohydrate products is absorbed during the reconstruction of the chlorophyll molecule. Carbon dioxid decomposes extracted chlorophyll both in light and in darkness, removing its magnesium and producing phæophytin. The earlier supposition that xantrophyll is one of the products has not been sustained. In the presence of zinc dust, the zinc takes the place of magnesium and the chlorophyll remains green as a stable zinc chlorophyll.

Apart from its protective function, carotin seems to be specially important as providing, during its photo-oxidation or partial disintegration, the massive hydrocarbon combination in the phytyl radicle of chlorophyll whose addition is necessary to convert the dicarboxylic glaucophyllin into the tricarboxylic chlorophyll. Xanthophyll can be reduced to carotin by the aid of metallic reductases, but no oxidases have been found capable of converting carotin into xanthophyll. The oxidation of these substances in darkness or in feeble light differs in certain respects from that taking place in intense light. The oxidation of carotin, xanthophyll, chlorophyll, and rhodophyllin, is more rapid at high temperatures than at low ones, and decreases in the order in which they are here named.

A rapid method is described of polymerizing formaldehyde to sugar, which has a definite end reaction and yields calcium and sodium tartrates as by-products.

The influence of concentration of sugar solutions upon the growth of microorganisms, O. Grove (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1918, pp. 34–38; Jour. Bath and West and South. Counties Soc., 5. ser., 13 (1918–19), pp. 127–131*).—The results are here detailed in tabular form, with discussion, of experiments made to ascertain the percentage of sugar needed to prevent development of certain microorganisms.

Yeasts and bacteria do not develop under the conditions here noted in a sugar solution of 50 per cent or more. The influence of concentrations and acidity is noted, as are also other characters. Penicillium is checked at 65 per cent, but even at 70 per cent feeble growth is noted after one month.

The growth of Aspergillaceæ and other fungi on strongly saccharin substrata, N. Bezssonof (*Ber. Deut. Bot. Gesell., 36 (1918), No. 10, pp. 646–648*).—Data are given regarding the growth of several Aspergillaceæ on substrata containing high percentages of saccharose.

The formation of soluble starch by mold fungi with particular reference to their synthesis of nitrogenous compounds, F. Boas (*Biochem. Ztschr., 86 (1918), No. 1-2, pp. 110-124*).—*Aspergillus niger* is able to produce easily soluble substances from quinic acid, more particularly from certain of its compounds. The comparative values of different carbon sources investigated are discussed.

Tyrosin in the fungi: Chemistry and methods of studying the tyrosinase reaction, C. W. Dodge (*Ann. Missouri Bot. Gard., 6 (1919), No. 1, pp. 71-92, fig. 1*).—The author has attempted to determine some of the chemical processes taking place in the reaction associated with the change to blue or black observed when certain fungi are exposed to the air. He concludes that the tyrosinase reaction is not deamination, although deaminases may exist in the same organism with tyrosinase, and that the tyrosin molecule is synthesized into a larger, more complex molecule, in which part of the carboxyl groups are either split off as carbon dioxid, or more probably bound in the molecule so that it will not react with alkali.

Importance of epidermal coverings, R. B. Harvey (*Bot. Gaz., 67 (1919), No. 5, pp. 441-444, figs. 2*).—It has been shown that undercooling of the tissues occurs to a greater degree in such herbaceous plants as possess protective epidermal coverings than in plants not so protected. Undercooling in such plants is due, not to substances in the cell sap, but mainly to the prevention of inoculation from ice formed on the surface of the tissue. A method is given for determining electrically the temperatures within leaf tissues.

The habitats of halophytes.—II, Plantago maritima, R. Kolkwitz (*Ber. Deut. Bot. Gesell., 36 (1918), No. 10, pp. 636-645, fig. 1*).—This is an account of the occurrence of *P. maritima* as regards geological regions and chemical content of the soil.

Water requirement and adaptation in Equisetum, L. Dosdall (*Plant World, 22 (1919), Nos. 1, pp. 1-13, fig. 1; 2, pp. 29-44, figs. 4*).—From a study of the water relations of Equisetum, undertaken to throw light upon the nature of bog xerophytes and the successional relations of Equisetum in the hydrosere and paleosere, as described with discussion, the author states that *E. fluviatile* requires a higher concentration of water in soil to maintain its normal functions and its life than does *Ranunculus sceleratus*, and probably higher than do *Helianthus annuus* and *Phaseolus vulgaris*.

Transpirational water loss is much greater from *E. fluviatile* than from the mesophytes and the xerophytes with which it was compared, from which fact it is concluded that this form is a true hydrophyte. This high transpiration is correlated with low photosynthetic efficiency as compared with the two plants above named. The fact that Equisetum can adjust itself to physical changes in the habitat by marked physiological responses, although it gives negative results as to adaptation, is considered to indicate that the xeromorphic features are extremely stable structures, and that adaptation to hydrophytic conditions has come about through the development of air-spaces, diaphragms, and permanently open stomata. The great amount of water lost through transpiration and guttation indicates that this species does not grow in the xerophytic regions of bogs because of its low absorptive powers, and that it can not be considered an actual xerophyte at all, its xerophily being only superficial and probably due to the persistence of ancestral structures now compensated by adjustment and by adaptation in the aerenchym. The apparent xerophily is not considered an indication of a dry climate or a physiologically arid habitat, because the water lost by the plants is great and means of checking it are absent. It is thought probable that the superficial xeromorphy of Equisetum was acquired in a cold arid period, such as the Permian.

E. fluviatile usually plays a secondary part in the various kinds of swamps. *E. hyemale* and *E. arvense* are found in much drier areas than is *E. fluviatile.* A comparison of the transpiration per unit area shows that the former are more mesophytic, which accounts for the fact that these two species are capable of invading grassland.

Studies on transpiration in high-moor plants, P. B. Jensen (*Bot. Tidsskr., 36 (1917), No. 2, pp. 144–154, fig. 1*).—In a study of transpiration employing *Empetrum* sp., *Vaccinium vitis idæa, V. uliginosum,* and *Betula* sp., it was found that the transpiration in high-moor plants is less than in plants growing on hard soil. The differences among the moor plants are rather small. It is thought that the diminution in the rate of transpiration produced by xeromorphy is compensated for by the stomata, which are more open in the xeromorphic plants. It is deemed possible that a difference in the transpiration in the two groups of plants may be found in years with greater rainfall.

The absorption of nutrients and allied phenomena in the pitchers of the Sarraceniaceæ, J. S. Hepburn, E. Q. St. John, and F. M. Jones (*Jour. Franklin Inst., 189 (1920), No. 2, pp. 147–184, figs. 7*).—In this report, the authors enumerate the species of Sarraceniaceæ, giving their geographical distribution, and noting their own observations on the nectar and on the wetting and the digestive power of the pitcher liquids. An account is also given of their studies on absorption by the pitchers of introduced liquids and on increased secretion by the pitchers of liquids in response to the introduction of such substances as acids and alkalis.

Water underwent absorption in the pitchers of *Darlingtonia californica* and the Sarracenias, as did also the solvent and (more rapidly) the solute in case of a nitrogenous compound dissolved in water. When a phosphate buffer was added, the nitrogenous component was still absorbed, though the pitcher contents increased in volume. Absorption of phosphate was less rapid than was that of water in case of a neutral phosphate solution. The percentage of the introduced nitrogenous compound or phosphate absorbed usually increased with the period of absorption. The lithium ion was absorbed from a solution of neutral lithium citrate. Absorption by the pitchers of substances introduced into their cavities was demonstrated by the decrease of the content of such substances in the solution, also by the appearance in the pitcher tissues of the element dissolved, as in case of lithium.

These results are held to indicate that the proteolytic products formed in the pitcher cavity by the digestion of the prey are absorbed by the pitchers, and utilized for the nutrition of the plant; also that phosphates and probably other mineral foods derived from the prey are absorbed and utilized in like manner.

The magnitudes and variations of osmotic values, G. Blum (*Zur Kenntnis der Grösse und Schwankung des Osmotischen Wertes. Inaug. Diss., Univ. Freiburg (Switzerland), 1916, pp. 113*).—The author reports the results of studies carried out on the osmotic values in different cells of given tissues and in different tissues of several plants; daily and annual variations in osmotic values; values on different sides of the same organ; and the influence of external factors. Particulars are given as noted in *Urtica dioica, Fagus silvatica, Helleborus fœtidus, Sedum acre,* and *Funaria hygrometrica.* The results are detailed in their connections.

While at a given height above the ground the osmotic pressures tend to approximate the same values, those of different layers may differ greatly; but the differences corresponding to height greatly outweigh those of different layers at a given height. The highest values, taking the plant as a whole or the leaf only, were found in the palisade, the lowest in the epidermal cells. Periodic variations, both daily and yearly, were noticed in the different tissues.

Light sources in phytophysiological studies, H. Sierp (*Biol. Zentbl., 38 (1918), No. 6, pp. 221-257, figs. 10*).—Numerical and graphical data are discussed as obtained with sources of light differing in regard to intensity and character (wave length) as related to the requirements of studies in the physiology of plants. A bibliography is appended.

Inheritance of certain flower characteristics in Papaver rhœas, J. Becker (*Ztschr. Pflanzenzücht., 6 (1918), No. 3-4, pp. 215-221, figs. 3*).—This account of an examination by the author of a vast number of flowers of *P. rhœas*, with regard to the possible and actual appearances of certain petal color markings, brings out the fact that these characters are affected by a very unfavorable situation (the influence of external conditions) as regards morphological characters.

Finland varieties of field peas, K. Teräsvuori (*Acta Soc. Fauna et Flora Fennica, 40 (1915), No. 9, pp. 1-142, figs. 2*).—This is the author's account of a study with particular reference to the number of seed fundaments and seed produced per pod, as noted in tests with peas of field varieties.

It was found that the number of seed fundaments per pod is influenced by the number and the position of the pods on the peduncle, this being greater in the single pod or in the older of a pair. The ordinal number of the node is not significant in this connection. As regards the number of seed fundaments, an individual has usually two or three kinds of pods which, for the greater part, belong to one or two neighboring classes. In case of individuals of a pure line grown under like conditions, most of the pods fall in one to three neighboring classes, of which one, or less often two, will include more than half of the variants. The number of seed fundaments in the pure line is in a certain degree dependent upon external conditions during the growth period, but it remains fairly constant from year to year.

As regards the number of seed fundaments, genotypic differences exist according to the tabular figures. A high or a low number of seed fundaments is not linked (genetically) with any given color in blooms, cotyledons, seed coats, or hilum, nor is it linked with size or fertility of seed.

Practically never do all the seed fundaments of a plant develop into seeds; the number of the latter being affected by the number and the position of the pod. Seed number per pod is more sensitive to external living conditions than is the number of seed fundaments. All gradations up to complete development of all the fundaments may be found in different pods of the same individual. Weather, but not earliness of a variety, appeared also to be significant. A negative correlation appears between number and weight of seed.

The morphological basis of some experimental work with maize, P. Weatherwax (*Amer. Nat., 53 (1919), No. 626, pp. 269-272*).—Employing certain characters of Indian corn as illustrative material, and reviewing work done recently by various authors, with their views, the author claims that many of the organisms most useful for establishing and testing the principles of heredity have an external appearance that may be very deceptive as indicating their true structure. This alone, he claims, is the key to the deeper significance of their genetic behavior.

Species placed by Saccardo in the genus Phoma, I-II, W. B. Grove (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., 1919, Nos. 4, pp. 177-201, figs. 23; 10, pp. 425-445, figs. 6*).—These notes are said to contain the results of studies on specimens placed by Saccardo in the Kew Herbarium, and to result from a continuation of studies previously noted (E. S. R., 38, p. 752) on the genus Phomopsis.

FIELD CROPS.

Methods of plant breeding, F. W. Hilgendorf (*New Zeal. Jour. Agr., 19 (1919), No. 6, pp. 354–358*).—This comprises a review of a paper, read before the New Zealand Institute Science Congress, dealing with the methods employed and some of the results secured in plant-breeding work, with particular reference to close pollinated plants such as the cereals. The author maintains that a study of fertilization in self-fertilized plants shows that variations in the offspring are rare, and that in the light of carefully conducted experiments they would seem to be entirely absent.

Sectional variety tests [in 1919] with corn, oats, barley, and soy beans, J. F. Cox and E. K. Chamberlin (*Michigan Sta. Quart. Bul. 2 (1920), No. 3, pp. 126–128*).—The tests with corn included 32 varieties grown in 24 localities. In lower Michigan, Golden Glow, Early Silver King, Folk White Cap, and Duncan; in central Michigan, Golden Glow, Pickett, and Early Silver King; and in the northern part of the State, Putnam Golden Glow, Nelson Golden Glow, and Ogemaw White Cap gave the highest yields. It is pointed out that a great improvement would result through the adoption of one or two of the best varieties and strains for widespread local distribution in the different corn-growing sections of the State.

Sixteen varieties of oats were tested in 12 well-distributed counties. The results of the experiments indicated that Wolverine, College Success, College Wonder, Worthy, White Bonanza, New Victory, Johnson, and Strube are superior in yield and quality.

The season was not favorable to the growth of barley. While all yields were low, Black Barbless, developed at the station, gave the highest yield, which is attributed as possibly due to superior drought resistance. Other varieties giving good yields were Michigan-2-row and Wisconsin Pedigree.

Soy bean varieties grown in six widely separated localities resulted in the best yields from Ito San, Black Eyebrow, Mongol, Hollybrook, and Early Brown.

Short season hay crops experiments, C. R. Megee (*Michigan Sta. Quart. Bul., 2 (1920), No. 3, pp. 125, 126, fig. 1*).—Experiments were made with spring sown and early summer sown crops.

Of the spring sown crops a mixture of 1½ bu. of oats and 1 bu. of peas per acre yielded 1.7 tons, and one of 2 bu. of oats and 20 lbs. of hairy vetch, 2 tons of air dry hay per acre, while oats alone gave 1.1 tons. Of the early summer sown crops corn gave the highest yield as well as the largest amount of total digestible nutrients.

Soy beans sown May 20 and June 7 yielded about 3 tons of air dry hay per acre. Certain varieties yielded about five times as much hay as others. The Ito San, Black Eyebrow, and Early Brown were quite reliable, while Mammoth Yellow and Ogemaw were quite inferior.

Of the millets Golden outyielded Hungarian, and Common ranked third. Japanese millet when allowed to become quite mature gave a good yield of hay of inferior quality. Sudan grass sown at the rate of 25 lbs. per acre gave a slightly larger yield than Golden millet, but was 10 to 14 days later in maturing.

Grain crop variety tests, E. B. Stookey (*Washington Sta., West. Wash. Sta. Mo. Bul., 7 (1920), No. 11, pp. 179, 180*).—The leading varieties in the test here reported were Blue Bell field peas; Minnesota No. 281, Banner, Sparrowbill, and Swedish Select oats; Hannchen and Blue barley; and Mexican Bluestem, Red Fife, Red Chaff, and Marquis wheat. Seeding from 3 to 3.5 bu. per acre of Blue Bell field peas gave the best results and the use of 60 to 80 lbs. of oats with

80 to 90 lbs. of peas proved most satisfactory for hay or silage. Seeding 140 lbs. of oats per acre gave higher yields than were secured from 100 and 120 lbs. per acre. In a 1-year test there was no gain from seeding more than 2 bu. of barley per acre.

Eight-inch v. four-inch drilling of grain, F. A. Welton (*Mo. Bul. Ohio Sta., 4 (1919), No. 8, pp. 246–248*).—Fourteen drilling tests with wheat, in progress for three years and including the rates of 4.5, 6.5, and 9 pk. per acre, showed an average gain of 0.75 bu. of grain and 16 lbs. of straw per acre in favor of the drills 8 in. apart. In a similar manner 30 tests with oats, conducted for four years and including rates of drilling at 5, 6, 6.5, and 8 pk. per acre, gave an average gain of 4.2 bu. of grain and 51 lbs. of straw per acre in favor of the 8-in. drilling.

Alfalfa in Wisconsin, R. A. Moore and L. F. Graber (*Wisconsin Sta. Bul. 308 (1919), pp. 34, figs. 21*).—This bulletin presents popular directions for the culture of alfalfa in the State, and reports briefly the results of several experiments conducted by the station at different times.

A comparison of the hay and protein production per acre of alfalfa, clover, and timothy showed that alfalfa yielded practically twice as much hay as was secured from clover and three times as much as was obtained from timothy. Alfalfa produced in a single season three times and nine times the quantity of protein produced by clover and timothy, respectively.

Alfalfa seedings made August 4 and 25, and September 15 and 25, 1914, and examined on May 12, 1915, showed a length of roots of 20, 13, 10, and 8 in., and a length of stems of 20, 17, 13, and 8 in. for the different dates of seeding, respectively.

It was found further that a mixture of 15 lbs. of alfalfa seed and 5 lbs. of timothy seed per acre makes a valuable combination. On a plat of alfalfa and timothy at the station, on which over 50 per cent of the alfalfa was killed out the second winter, the hardier timothy took the place of the dead alfalfa plants, and the average yield for the third and fourth years was 6,850 lbs. of hay per acre in two cuttings.

In studying the effect of late fall cutting it was noted that alfalfa cut September 2, 1914, had reached a height of 22 in. on May 12, 1915, as compared with 17 in. for alfalfa cut September 26.

The results of tests of seed from different sources showed variations in hardiness in some instances even between seed secured from different growers in the same State, and indicated that for Wisconsin the most winter resistant alfalfas are Grimm, Baltic, and Cossack.

In another test a plat was seeded June 27, 1914, with Montana grown seed and a similar plat from the same lot of seed on June 23, 1915. Both plats had excellent stands in the fall of 1915, but in the spring of 1916 about 76 per cent of the two-year-old plat and only about 9 per cent of the new seeding had winterkilled. This result is taken as indicating that the new seedings of common alfalfa are the hardier, and this conclusion was borne out by reports from growers over the State received at that time.

Alfalfa seed production, F. A. Spragg and E. E. Down (*Michigan Sta. Quart. Bul. 2 (1920) No. 3, pp. 130–132, figs. 2*).—The production of alfalfa seed in Michigan is briefly noted, and the results in this line secured at the station are reported as indicating that alfalfa is a satisfactory seed-producing crop when properly handled.

Planting rates and spacing for corn under southern conditions, C. A. Mooers (*Jour. Amer. Soc. Agron., 12 (1920), No. 1, pp. 1–22, figs. 3*).—In this paper, a contribution from the Tennessee Experiment Station, the author summarizes data secured in variety tests conducted in various parts of the State in an effort to formulate an accurate method for determining the proper stand of corn with regard both to the productivity of the soil and to the variety. Observations were also made on the best rate of planting corn for silage, and on the effect of variations in the grouping and spacing of a given number of plants. Various planting rates were employed, ranging from 6,000 to 10,000 plants per acre on rich bottom land, and from 4,200 to 6,600 plants on good upland soil at Knoxville, while in western and central Tennessee the rates varied from 3,000 to 5,400 plants per acre. In general, the yields ranged from 30 to 80 bu. per acre, although some experiments were made on soil which under average conditions produced less than 30 bu. Data have been assembled which are held to indicate the proper stand for each of a number of varieties of corn grown on soils of different degrees of productiveness. The conclusions reached may be summarized as follows:

The rate of planting corn is of much practical importance in the South, but a definite rule is needed, as too thick planting is of common occurrence. Different varieties require appreciably different rates of planting, the small and short-season varieties, in general, requiring thicker planting than the large, long-season sorts.

The experimental results indicated a close relationship between the best rate of planting for grain production and a definite yield of grain per plant. To approximate the proper stand of corn, the following equation is suggested: $N=\frac{56\,Y}{F}$, when N represents the number of stalks per acre, Y the expectancy, or approximate production in bushels per acre of the field in question under average seasonal conditions, and F the standard varietal factor, or average weight of grain per plant at the best rate of planting, as determined experimentally for the variety in question. On land of high productiveness the average weight of grain per plant at the best rate of planting was found to vary from year to year with the nature of the season, the more favorable the season the greater being the weight. The standard varietal factor is, therefore, practically the average result obtained for all seasons.

It is stated that the data obtained may be interpreted as indicating that a varietal factor is practically a constant between the 36- and 65-bu. limits of productivity, although the evidence indicates that as the productiveness of the soil changes a change should be made in the varietal factor. Based on the average for 15 varieties, this change was calculated to be 0.0014 per bushel change in expected yield. A table of standard factors for 24 varieties is given, and the following formula is developed for use in connection with the table:

For land producing on the average more than 64 bu. per acre,

$$N=\frac{56\,Y}{F+(Y-64)0.0014}.$$

For land producing on the average less than 64 bu. per acre

$$N=\frac{56\,Y}{F-(64-Y)0.0014}.$$

In addition the suggestion is made that no rate of planting should be less than that calculated for a 25-bu. crop. The margin of safety seemed to go with a too high rather than a too low rate of planting.

The results of three series of experiments agree in showing that the best rate of planting silage corn was little different from that which gave the highest yield of grain, although in practice a material increase seems warranted. In the spacing experiments the conclusion was reached that the best results in practice will probably be obtained with a width of row which permits the satisfactory use of tillage implements, but allows the determined number of stalks to be as widely spaced as possible.

The improvement of the yield of Sea Island cotton in the West Indies by the isolation of pure strains, II, S. C. Harland (*West Indian Bul., 17 (1919), No. 4, pp. 210–236*).—Supplementing work previously noted (E. S. R., 41, p. 531), the author presents a detailed discussion of further observations made by him at St. Vincent and of date secured by W. Robson in breeding work conducted in Montserrat during the period 1916–1918, inclusive.

Both the St. Vincent and Montserrat strains were grown from self-fertilized seed derived from single-plant selections. The characters studied in the Montserrat strains included the mean maximum lint length in millimeters, the weigh*of lint per seed in milligram, the mean seed weight in milligrams, and the number of bolls per pound of seed-cotton. The St. Vincent strains were examined for weight of lint per seed, mean seed weight, and mean maximum lint length. Information is also given on correlations between lint weight of the parent strain and the mean lint weight of the progeny, lint weight and lint length, lint weight and seed weight, lint weight and lint per boll, lint weight and lint per acre, lint length of parent strain and mean lint length of progeny, seed weight of parent strain and mean seed weight of progeny and lint per acre of parental strain and lint per acre of progeny. A method of improving Sea Ialsnd cotton is outlined, which is said to give practical results in a comparatively short time.

Summerizing the results secured, it is stated that "short-linted plants can be eliminated easily and rapidly from the commercial crop by the adoption of the pedigree culture method. Slight differences in lint, length, weight of lint per seed, seed weight, and weight of lint per boll are hereditary, and are maintained from season to season. The yield of Sea Island cotton can be increased by selecting plants possessing certain combinations of morphological characters. Particular attention should be paid to weight of lint per seed and seed weight. Weight of lint per seed is correlated with weight of lint per boll and with weight of lint per acre. Types of high seed weight must be grown, because the maximum weight of lint per seed can only occur if the seed weight is also at the maximum. There is a strong correlation between parent and mean of progeny in respect of the characters lint length, lint weight, and seed weight. The character of a plant, therefore, affords some guide to the kind of progeny it will produce, but in general the inherent worth of a plant can only be judged in terms of the average behavior of its progeny. Lint length and lint weight are possibly negatively correlated, but there is a need for further investigation of the subject. No strain exists at the present time possessing the combination of long lint (above 55 mm.) and high lint weight (above 55 mg.).

"The chief danger of pure strain work with Sea Island cotton is that valuable combinations of Mendelian factors may be permanently lost, unless full attention be given throughout the period of selection to all the morphological and physiological characters bearing on yields. The particular combination of Mendelian factors which has given rise to the Montserrat strain of lint weight 60 mg. appears to have been eliminated from the St. Vincent and St. Kitts commercial cottons. The yield of St. Vincent and St. Kitts cottons can undoubtedly be increased by crossing them with the heaviest yield Montserrat strain, and the whole question of artificial hybridization in relation to cotton breeding is discussed at length."

Northern Ontario as a source of seed potatoes, J. Miller (*Ontario Dept. Agr., Ann. Rpt. Agr. and Expt. Union, 39 (1917), pp. 17–23*).—This report with discussion brings out the fact that in northern Ontario the conditions are prevalent under which the potato thrives best, a prominent factor being the immaturity of the seed there produced, which greatly increases the yield from such seed potatoes. Other factors discussed are the long days of sunshine, cool nights, abundant moisture, absence of drought periods, and comparative freedom from physiological diseases.

Spring planting of Rosen rye proves unsatisfactory, F. A. SPRAGG and E. E. DOWN (*Michigan Sta. Quart. Bul. 2 (1920), No. 3, pp. 132, 133, fig. 1*).—Plantings of Rosen rye were made at different dates. The planting made September 25 yielded at the rate of 46.8 bu. per acre. A number of check plats planted October 10 averaged 44.6 bu. per acre. The planting made November 21 gave 5.4 bu. per acre, and two plantings made on April 9 were total failures.

Sugar cane experiments in the Leeward Islands, 1916–17 and 1917–18, A. E. COLLENS ET AL. (*Imp. Dept. Agr. West Indies, Sugar-Cane Expts. Leeward Isl., 1917–18, pt. 1, pp. 87*).—This describes variety tests with sugar cane conducted in Antigua, St. Kitts, and Nevis in continuation of similar work previously noted (E. S. R., 38, p. 437). A report of the fertilizer experiments is to appear later. Data are given showing the rainfall at the various experimental centers during the seasons indicated.

In Antigua, the two leading plant canes for the season of 1916–17 were B. 6308 with 26.3 tons of cane per acre and 5,240 lbs. sucrose, and Sealy Seedling with 29.1 tons of cane and 4,700 lbs. sucrose. The highest yields for the season of 1917–18 were secured from B. 3922 with 23.75 tons of cane and 4,370 lbs. sucrose, and B. 6308 with 22.33 tons of cane and 3,910 lbs. sucrose. Sealy Seedling with an average yield of 6,330 lbs. sucrose per acre was first of 10 varieties grown for the past 17 years. Uba with 22 tons of cane and 3,170 lbs. sucrose, and B. 3922 with 14.9 tons of cane and 2,760 lbs. sucrose were the highest yielding ration canes tested during 1916–17. The best sorts tested during the season of 1917–18 were B. 109 with 13.75 tons of cane and 2,000 lbs. sucrose, and B. 3922 with 10.85 tons of cane and 1,820 lbs. sucrose. Of 12 varieties of ratoon cane grown during the past 16 years, Sealy Seedling was first with 3,570 lbs. sucrose per acre.

B. 6308 with 33.2 tons of cane and 7,820 lbs. sucrose, and B. 6388 with 30.8 tons of cane and 7,670 lbs. sucrose were the best plant canes grown in St. Kitts during the season of 1916–17, while Ba. 6032 with 33.4 tons of cane and 7,080 lbs. sucrose, and B. 6308 with 32.3 tons of cane and 7,030 lbs. sucrose were best during the 1917–18 season. The highest-yielding ratoon canes for the 1916–17 season were A. 2 with 27.4 tons of cane and 5,850 lbs. sucrose, and B. 254 with 24.9 tons of cane and 5,800 lbs. sucrose. During the 1917–18 season the best results were obtained from B. 1528 with 21.8 tons of cane and 4,120 lbs. sucrose, and B. 6346 with 17.7 tons of cane and 4,000 lbs. sucrose. Observations on a number of seedlings are also noted.

In Nevis the highest-yielding plant canes for the 1916–17 season were B. 6308 with 51 tons of cane and 11,480 lbs. sucrose, and B. 1528 with 36.9 tons of cane and 8,590 lbs. sucrose. The best sorts grown during the 1917–18 season were B. 4596 with 20.1 tons of cane and 4,600 lbs. sucrose, and B. 254 with 18.8 tons of cane and 4,100 lbs. sucrose. No ratoon canes were harvested in the experiment.

The sugar cane industry of Brazil (*Industria Assucareira no Brazil. Rio de Janeiro: Min. Agr., Indus., e Com., Dir. Geral Estatis., 1919, pp. 102, pls. 2*).—Statistical information is given relative to the production and exportation of sugar.

Rust-resisting sunflowers, F. A. SPRAGG and E. E. DOWN (*Michigan Sta. Quart. Bul. 2 (1920), No. 3, pp. 128, 129, fig. 1*).—Four varieties, Mantica, Kaeurpher from South America, Mammoth Russian, and Dubble Mixed, were compared, with the result that the South American variety was outstanding in rust resistance. It is stated that this variety is composed of many types, and that from these selections may be made to meet the needs of varied conditions.

[Tobacco] (*Bol. Tec. [R. Ist. Sci. Sper. Tabacco, Scafati], 16 (1919), No. 1, pp. 5–48, pls. 3*).—This publication includes a description of *Nicotiana chinensis* and brief reviews of numerous technical and popular articles from different sources dealing with the production of tobacco.

[Wheat-crossing], J. Jelinek (*Ztschr. Pflanzenzücht., 6 (1918), No. 1, pp. 55–57*).—The author describes a method of crossing wheat which is said to result in a marked increase in the number of seeds set by the hybrid.

The essential points of the method include the planting of the parent strains side by side, the emasculation of the spike of the female parent, and the binding together of the emasculated spike and a spike of the male parent. The spikes are then wrapped with paper, which is removed after about 14 days. In the case of an attempted cross of sorts maturing at different times, it is suggested that the early maturing kind be planted later, or that it be planted somewhat deeper than the late maturing strain so that the spikes will ripen at the same time.

Fertilizing the wheat crop of 1920, C. E. Thorne (*Mo. Bul. Ohio Sta., 4 (1919), No. 8, pp. 235–240, fig. 1*).—This article considers the use of fertilizers, drainage, crop rotations, and liming as related to wheat production and points out briefly some of the results secured in the station experiments.

In a 25-year experiment wheat was grown continuously and in rotation without fertilizer treatment, with applications of commercial fertilizers consisting of 160 lbs. each of nitrate of soda and acid phosphate and 100 lbs. of muriate of potash per acre, and with the use of 5 tons per acre of barnyard manure under continuous culture and of 4 tons under crop rotation. Under continuous culture the average yield per acre for the first five years without fertilizer treatment was 10.1 bu., and for the last 5 years it was 8.4 bu. as compared with 9.3 and 19.3 bu., respectively, where the crop was grown in rotation. On the plats receiving commercial fertilizers the yields were 19.8, 22.3, 20.5, and 33.1 bu., and on those treated with barynard manure 15.8, 23.5, 11.6, and 32.5 bu. per acre, respectively.

In a 5-year rotation of corn, oats, wheat, clover, and timothy the equivalent of 2 tons of ground limestone per acre was applied after the land had been plowed for corn, and during each 5-year period for 25 years two dressings of barnyard manure were applied at the rate of 8 tons per acre each on corn and wheat. As compared with unlimed land otherwise similarly treated the average yields for the last 5-year period showed the following gains per acre in favor of liming: Corn 11.9, oats 3.2, and wheat 4.4 bu., clover 930 lbs., and timothy 2,600 lbs. On lands similarly limed but receiving no fertilizer treatment during the 25 years the increases for the last 5-year period due to liming were as follows: Corn 10, oats 15, and wheat 8.8 bu., clover 1,310 lbs., and timothy 1,660 lbs. per acre.

The results of 26 experiments with acid phosphate, in progress in 13 counties for 25 years, are reported as indicating that in the rotations followed the crops other than wheat paid for the acid phosphate applied, and that the average increase or gain was 5 bu. of wheat for every 100 lbs. of acid phosphate used.

Wheat in a 5-year rotation followed at Wooster for 25 years on land receiving each 5-year period 320 lbs. of acid phosphate together with nitrogen and potassium costing $21 on a prewar basis yielded an average of 28.42 bu. per acre. On the same farm wheat grown for 21 years in a 3-year rotation of corn, wheat, and clover, the corn receiving 8 tons of fresh barnyard manure and 320 pounds of acid phosphate per acre, gave an average acre yield of 28.79 bu. It is pointed out that while these experiments are not exactly comparable the results would seem to indicate that manure may be substituted for nitrogen and potash.

HORTICULTURE.

Vegetable culture, J. Vercier (*Culture Potagère. Paris: Hachette & Co., 1919, 4. ed., pp. VI+402, figs. 269*).—A treatise on vegetable growing in France, issued as one of the volumes of the Encyclopédie des Connaissances Agricole, under the direction of M. E. Chancrin.

Methods for marketing vegetables in California, S. S. Rogers (*California Sta. Circ. 217 (1920), pp. 19*).—A detailed discussion of market methods and the formation and management of vegetable marketing organizations, including other data of value to the vegetable grower, such as a list of the leading varieties of vegetables for California, seasons in which various vegetables are in most demand, marketing requirements of vegetables, and the production of vegetables for the cannery and drier.

Fruits for Minnesota planting (*Minn. Hort., 48 (1920), No. 2, p. 45*).—A list of orchard and small fruits, including ornamental fruiting shrubs and nuts, adopted by the Minnesota State Horticultural Society.

Minnesota State Fruit-Breeding Farm in 1919, C. Haralson (*Minn. Hort., 48 (1920), No. 2, pp. 34, 35*).—A brief progress report on breeding and selection work with orchard and small fruits.

Among recent fruits of special promise resulting from the work are several seedling apples; the No. 70 plum, a cross of Burbank with a native variety, which is a clingstone of the very best quality not subject thus far to plum rot or any other diseases; hardy crosses of *Prunus nigra* and *P. triflora;* several seedling annual and everbearing strawberries; seedling gooseberries; the Minnesota No. 4 raspberry; and a hybrid black cherry of good quality and size.

Report of committee examining Minnesota State Fruit-Breeding Farm, W. H. Eddy, H. Lake, and A. B. Lyman (*Minn. Hort., 48 (1920), No. 2, pp. 36, 37*).—A brief résumé of the work noted above.

Varieties of fruit for Wyoming, M. D. Harris (*Bien. Rpt. Wyo. Bd. Hort., 7 (1916–18), pp. 17–22*).—Suggestions on varieties of fruit suitable for the home orchard in Wyoming.

Spraying and dusting experiments, 1918, W. H. Brittain (*Ann. Rpt. Fruit Growers' Assoc. Nova Scotia, 55 (1919), pp. 102–110*).—Experiments conducted in 1918 indicate that the major part of spray injury from lime-sulphur can be attributed to the final or fourth spray. Injury was invariably greater where the lime-sulphur was sprayed up from below the tree than when sprayed from above the tree. Apple scab was, generally speaking, controlled best by spraying downward. There was no abnormal leaf drop when 7 : 7 : 100 Bordeaux was substituted for the fourth lime-sulphur spray. Plats dusted with lime-sulphur showed no abnormal leaf drop. Scab was efficiently controlled by lime-sulphur, soluble sulphur, and Bordeaux. Lead arsenate also appeared to have a decided fungicidal value.

Relative to the value of dusting as compared with spraying, the author concludes from two seasons' tests that dusted arsenicals and sprayed arsenicals are both efficient, if properly applied. Under certain conditions, dusting with lime-sulphur may give as good scab control as spraying. At other times, and especially against a severe outbreak, it is somewhat inferior. Although having great advantages in rapidity and ease of application, the practicability of displacing spraying with dusting is still unproved.

The propagation of apple trees on their own roots, J. K. SHAW (*Massachusetts Sta. Bul. 190 (1919), pp. 73–96, pls. 4*).—In connection with a general study of the interrelation of stocks and scion among apples, work was undertaken to produce stocks of known parentage by inducing root formation from the stems of selected varieties. The methods used and the results obtained are here discussed in detail, together with a discussion of the histology of the twig in relation to root formation, which is based on work conducted by R. P. Armstrong, a graduate assistant.

In the trials reported stem cuttings of apples failed to grow, though callus formation in some varieties was good. Root cuttings grew well, though growth was slow the first season. Limited tests indicated that most varieties may be propagated by mound layers. The nurse-root method gave the best results. The scion was whip-grafted on a short piece of root and planted deeply. Rooting from the scion took place at the end of one or two seasons' growth, after which the nurse root was removed and the tree replanted. Neither dwarf apple nor pear roots were of value as nurse roots.

There was a great variation between and within varieties as to the readiness with which they sent out roots from the scion. Of 14 varieties propagated in considerable numbers in successive years and under different conditions Tolman only produced 3 per cent of rooted trees, whereas Sweet Bough produced 98 per cent.

Generally speaking, the softer the wood the higher was the proportion rooting from the scion. There was apparently a relation between the varietal ability to produce roots from the scion and the thickness of the cambium layer at the dormant season. A fertile, well-drained, sandy loam probably offers the best conditions for securing a high percentage of rooting trees. Once trees are established on known roots they may be reproduced true to type either by the root cuttings or by grafting on the known roots.

Ohio apple orchard fertilization, I, F. H. BALLOU (*Rural New Yorker, 79 (1920), No. 4576, p. 456, figs. 2*).—The author cites evidence based on fertilizer investigations conducted by the Ohio Experiment Station to show that it is not safe to depend on single unfertilized rows of trees as checks for more than a very brief term of years. After a few years the roots of the check trees may reach over into the fertilized plats and render the results of the experiment inaccurate.

During the course of the station's fertilizer studies there has not been a single instance in which fertilization with quickly available nitrogenous plant food has failed to increase greatly the vigor, fruitfulness, and cash returns of the trees thus treated as compared with the unfertilized or check trees. Three upland orchards in which fertilization tests were first established returned a clear gain of $125.75 an acre per year from the sections where nitrate of soda was used.

Manuring experiments, 1917–18, J. M. WARD and P. H. THOMAS (*Agr. and Stock Dept. Tasmania, Bul. 75 (1918), pp. 3*).—The results to date are given of a series of fertilizer experiments that are being conducted in a run-down apple orchard. Thus far nitrogen appears to be the limiting factor.

Apple spraying in 1919, G. E. SANDERS (*Ann. Rpt. Fruit Growers' Assoc. Nova Scotia, 1919, pp. 110–118*).—Summing up the evidence from tests conducted during 1918, the author recommended the following formula for 1919: First spray, 3:10:40 Bordeaux, 1:40 arsenate of lime; second spray, 2:10:40 Bordeaux, 1:40 arsenate of lime; third spray, soluble sulphur 1 lb. or sulfocide 1 qt. to 40 gal. water, 5.40 lime, 0.5:40 arsenate of lime; fourth spray, 2:10:40 Bordeaux, 1:40 arsenate of lime.

It is believed that under usual conditions this program will enable the control of insect pests and fungus diseases, without reducing the crop and without causing fruit russet and foliage injury. When cankerworm is prevalent, it is advisable to use 6 lbs. of paste arsenate of lead or 3 lbs. of dry arsenate of lead to 40 gal. of water plus 5 : 40 hydrated lime immediately before the blossoms open in place of the regular formula. When tussock moth is serious, the above treatment for cankerworm should be used in place of the regular formula for the third or calyx spray.

Costs and profits in the Minnesota apple orchard, W. G. BRIERLEY (*Minn. Hort., 48 (1920), No. 2, pp. 46–51*).—A contribution from the University of Minnesota, presenting data on an orchard survey conducted in 1918–19 by W. J. Koppen under the direction of the author.

Summarized data for 30 orchards averaging 15 years of age, aggregating 159 acres and with an average yield of 133 bu. per acre, showed the average labor costs per acre to be $47.25, materials cost $20.06, fixed costs $37.65, and overhead cost $3.14, or a total of $108.10 per acre. The net profit per acre was $30.68, and the net profit per bushel, $0.23.

In four well-handled orchards, aggregating 25 acres, the receipts per acre were $410.48 and the costs per acre $184.17, as compared with receipts per acre of $15.15 and costs of $30.99 in four poorly handled orchards aggregating 27.5 acres.

Pears: Production estimates and important commercial districts and varieties, H. P. GOULD and F. ANDREWS (*U. S. Dept. Agr. Bul. 822 (1920), pp. 16, figs. 3*).—A joint contribution from the Bureau of Plant Industry and the Bureau of Crop Estimates of this Department. It discusses the relative importance and extent of the pear industry in the United States, presents statistical estimates of the annual production of pears for the years 1909–1919, inclusive, and gives an account of the important commercial districts and varieties by States.

The floral biology of the peach, I–II, A. MANARESI (*Staz. Sper. Agr. Ital., 44 (1911), No. 3–4, pp. 175–209; 52 (1919), No. 1–2, pp. 42–68*).—A contribution from the Royal Agricultural High School, Bologna, discussing factors affecting fruitfulness of the peach and continuing previous studies of the effect of annular decortication or ringing (E. S. R., 21, p. 439). A bibliography of related literature is given.

Relative to the effects of ringing the branches, the author concludes that this process notably increases production in addition to yielding larger and earlier maturing fruit without materially injuring the tree. The thickness of the foliage and the fruit stock is increased on ringed branches.

A test made to determine the value of sulphuring during the flowering period indicated that sulphuring during this time was of little value and tended to reduce the crop.

In the second part the author presents results of pollen germination studies of a large number of varieties of peaches. A bibliography of related literature is appended.

The new hybrid plums, D. C WEBSTER (*Minn. Hort., 48 (1920), No. 2, pp. 43, 44*).—Brief notes on several hybrid plums originating at the Minnesota State Breeding Farm and under test by the author.

Making graft-unions, L. RAVAZ (*Prog. Agr. et Vitic. (Ed. l'Est-Centre), 41 (1920), No. 8, pp. 178–182, figs. 14*).—A detailed illustrated account of methods employed in preparing scion and stock cuttings of grapes, making the union, and rooting the grafted cuttings.

China mulberry and sericultural work (*Amer. Silk Jour.*, *39* (*1920*), *No. 3*, *pp. 64–66*, *pl. 1*, *figs. 5*).—A report of the University of Nanking on progress made in the establishment of mulberry plantations and the production of silkworm eggs.

The budding and grafting of cacao, R. O. Williams (*Proc. Agr. Soc. Trinidad and Tobago*, *19* (*1919*), *No. 12*, *pp. 294–301*).—A paper on the propagation of cacao, with special reference to the importance of propagating from selected seed, buds, and scions, as determined in the cacao experiments of the Trinidad and Tobago Department of Agriculture in their natural-yield tests of cacao (E. S. R., 39, p. 143).

The future of cacao, P. de Moraes (*Brasil Agr.*, *4* (*1919*), *No. 10*, *pp. 271–278*, *figs. 8*).—A statistical review of the cacao industry, with special reference to the future of the industry in Brazil.

Variation in coconuts, T. Petch (*Trop. Agr.* [*Ceylon*], *54* (*1920*), *No. 1*, *p. 1*, *pl. 1*).—Of 5 nuts on a bunch of coconuts, 3 were green and 2 yellow in color. One nut of each color was planted side by side. The plant from the yellow nut has a distinctly yellow tinge with a yellow or bronze midrib to the leaves, and is making less vigorous growth than the plant grown from the green nut. This fact indicates that yellow varieties may have originated as sports from the normal green varieties, and unless desirable on account of other qualities they should not be planted because of their slower growth, owing to their chlorotic condition.

The effects of alkali on citrus trees, W. P. Kelley and E. E. Thomas (*California Sta. Bul. 318* (*1920*), *pp. 305–337*, *figs. 2*).—The authors made a survey of several citrus groves in different localities of southern California to determine the effects of alkali, preliminary to a study of methods of combating alkali. The results of this survey are discussed and related studies briefly reviewed. In lieu of more definite information some general suggestions are given for the treatment of injured groves. Several analyses of soils and irrigation waters are appended.

Severe alkali injury was observed in a number of citrus groves in several districts, and a large percentage of this injury was due to irrigation water. Chlorids were the most injurious constituents of the waters, although in certain localities some of the waters also contained injurious amounts of sulphates and carbonates. The irrigation supplies rarely contained enough alkali to harm citrus trees directly, but the injury was due to the concentration of salts after a variable period of years, depending on the nature of the soil, the amounts of alkali in the water and soil, rate of evaporation, etc. Alkali injury was also brought about in an experimental plat at the Citrus substation by repeated large applications of nitrate of soda.

Examination of the nature of alkali injury showed that an excess of chlorids causes the tips and margins of citrus leaves to become yellow or brown, followed by defoliation. Sometimes a large portion of the leaves fall, and the young, tender shoots may be killed. An excess of sulphates and bicarbonates, on the other hand, is more likely to stunt the growth of the trees and cause the leaves to become chlorotic. More or less mottle leaf may also occur. Lemon trees are apparently injured by lesser amounts of alkali than oranges.

The effects of alkali are intensified by the puddling effect of continued irrigation with waters containing sodium salts, particularly those containing sodium carbonate and sodium bicarbonate. Under such conditions the alkali can not leach down beyond the citrus roots. It is especially important to keep the soil open and porous where nitrate of soda or saline irrigation water is used in regions of light rainfall. To accomplish this, the use of deep-rooted cover crops and plowing under organic materials such as manure or bean straw is recommended. When saline water is the only source of irrigation, the use of the basin or flooding systems instead of the furrow system of irrigating may afford temporary relief from alkali injury in case the subsoil drainage is satisfactory. By increasing the alkaline content of the drainage water, however, the ground water may ultimately become heavily charged with salts. Observations made in one district showed the most effective treatment for injured groves to consist of thorough tillage, plowing down manure, and the application of irrigation water free from alkali.

Pruning the navel orange, R. W. HODGSON (*Cal. Citrogr., 5 (1920), No. 5, pp. 138, 169*).—A contribution from the University of California discussing the pruning of both young and bearing navel orange trees.

Control of humidity conditions in lemon storage rooms, A. D. SHAMEL (*Cal. Citrogr., 5 (1920), No. 5, pp. 137, 170, 171, figs. 3*).—A popular summary of work previously reported (E. S. R., 36, p. 842), with illustrations of the humidifier designed by the author.

Report on the production of tea in India in the calendar year 1917, G. F. SHIRRAS (*Dept. Statis., India, Rpt. Prod. Tea, 1917, pp. [4]+29, pl. 1*).—A statistical report on the area and production of tea, number and area of plantations, and number of persons employed in each district in India in 1917, including summaries of area and production since 1885, as well as other comparative data. A chart is given illustrating the growth of production and exports and the variations in price of tea during the previous 15 years.

Importance of the Spanish nut trade, C. J. JONES (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Com. Rpts. No. 55 (1920), pp. 1314–1320*).—A consular report on the nut industry in Spain, consisting mainly of production and export statistics.

Teas' hybrid catalpa, D. F. JONES and W. O. FILLEY (*Jour. Heredity, 11 (1920), No. 1, pp. 16–24, figs. 6*).—A contribution from the Connecticut State Experiment Station. The authors first discuss the origin and characteristics of the Teas natural hybrid catalpa. An account is then given of a cross made by H. K. Hayes in 1911 between the supposed parents, *Catalpa bignonioides* and *C. kaempferi*, of the Teas hybrid.

Observations were made by the authors relative to the growth and character of the parent species and the hybrid. The data secured show that the resulting form coincides with the Teas hybrid in all its characters, including its greater vigor of growth and hardiness and more showy inflorescence than the parent forms, thereby confirming the supposed parentage of the Teas hybrid.

The best of our newer and rarer foliage trees, P. KACHE (*Mitt. Deut. Dendrol. Gesell., 28 (1919), pp. 213–254*).—Notes on new or little known ornamental trees and shrubs.

Notes on the genus Dahlia, with descriptions of two new species from Guatemala, W. E. SAFFORD (*Jour. Wash. Acad. Sci., 9 (1919), No. 13, pp. 364–373, figs. 4; abs. in Jour. Heredity, 11 (1920), No. 1, p. 48*).—A contribution from the Bureau of Plant Industry of the U. S. Department of Agriculture.

The author points out the inadequate botanical classification of our garden forms of dahlias, and suggests a revision of the genus based on the study of material collected in the elevated regions of Mexico and Central America, where the plants are endemic, rather than upon garden-grown specimens. Two new ornamental species, *Dahlia popenovii* and *D. maxonii*, collected in Guatemala by W. Popenoe and W. R. Maxon, respectively, are described. Plants of the latter species, which is known as the tree dahlia, grow to the height of from 8 to 15 ft. This tree dahlia is extensively used in Guatemala for hedges, and the buds and young shoots eaten as greens.

FORESTRY.

Forestry and a forest policy for New York, H. P. BAKER (*N. Y. Forestry, 7 (1920), No. 1, pp. 24–31*).—A discussion of the importance of forestry to New York, including a résumé of the points that should be included in the development of a forestry policy for the State.

Notable things accomplished by the Pennsylvania Department of Forestry since its establishment, to date (*Forest Leaves, 17 (1920), No. 7, pp. 99–101*).—A concise enumeration of the more important achievements in Pennsylvania along the lines of general forest administration, silviculture, forest legislation, and forest education.

Forest legislation in the returned territory, R. TRIFONE (*R. Ist. Super. Forestale Naz. Firenze [Pub.], 3 (1919), pp. 87*).—A contribution from the Superior Institute of Forestry at Florence, Italy. It comprises a study of forest legislation under Austrian rule in the territory returned by Austria to Italy, with special reference to its application to this region as an Italian province.

The forest experiment station's thinning areas, G. SCHOTTE (*Statens Skogsförs. Anst. [Sweden], Flygbl. 11 (1918), pp. 7, figs. 7*).—Instructions are given for the use of the forest staff in making timber surveys.

Influence of the forests upon the climate, J. HANN (*Mitt. Deut. Dendrol. Gesell., 28 (1919), pp. 110–116*).—A partial review of the literature on the subject.

The forests of Buchanan County, Va., W. G. SCHWAB (*Va. Geol. Survey Bul. 18 (1918), pp. 251–270, pls. 7*).—An account of the forests of Buchanan County, Va., discussing forest types, distribution and classes, commercial species, past and present methods of lumbering, lumber and other products, stumpage values, reproduction and rate of growth of young stands, forest fires, and the future of the forests and lumber industry.

The application, adaptation, and usefulness of exotic trees in Westphalia, H. GRAF ZU STOLBERG (*Mitt. Deut. Dendrol. Gesell., 28 (1919), pp. 100–106*).—Notes on the adaptation of a large number of exotic coniferous and deciduous trees to Westphalian conditions.

First inventory of the woods and other forest products of Tonkin, A. CHEVALIER (*Bul. Écon. Indochine, n. ser., 21 (1918), Nos. 131, pp. 497–524; 132, pp. 742–884, pl. 1; 22 (1919), No. 137, pp. 495–535*).—The inventory is based on missions to Tonkin undertaken by the author in 1913 and again in 1917 and 1918, as well as on available literature.

Part 1 contains a general account of the existing forests and forest types, examines the causes leading to the devastation of the forests, and suggests the organization of a forest service for the development of adequate administration, rational exploitation, and forest research, with the view of insuring a future supply of forest products for local needs and for export trade. Part 2 comprises an inventory of the forest species by families, information being given when known relative to the scientific and native nomenclature, distinguishing characteristics, dimensions, and geographic distribution of the species, as well as the properties, uses, and market value of the wood. Part 3 deals with minor forest products and also contains a density table for the woods of Tonkin, together with an index of the woods included in the inventory.

The Venezuelan mahogany, a hitherto undescribed species of the genus Swietenia, H. PITTIER (*Jour. Wash. Acad. Sci., 10 (1920), No. 2, pp. 32–34*).—An account is given of study by the author of a tree which has been considered as identical with *S. mahogoni*, but which he describes as a new species and to which the name *S. candollei* is given. It is found in Venezuelan forests, and was formerly planted extensively in hedges and in parks and along streets

Rubber research in the Dutch East Indies, T. PETCH (*Trop. Agr. [Ceylon], 54 (1920), No. 1, pp. 6–9*).—A list, compiled from the Nederlandsch-Indisch Rubber Jaarboek, is given of experiment stations and estates now engaged in rubber research in the Dutch East Indies.

Note on the mechanical strength and seasoning properties of Shorea robusta (sal) timber, R. S. PEARSON (*Indian Forest Rec., 7 (1919), No. 6, pp. 26*).—In continuation of a previous memoir (E. S. R., 30, p. 239) the results are given of hardness, toughness, and seasoning tests conducted with various samples of sal timber grown in different localities in the Central and United Provinces of India.

How lumber is graded, H. S. BETTS (*U. S. Dept. Agr., Dept. Circ. 64 (1920), pp. 39, figs. 10*).—A summary and discussion of the grading rules adopted for various hardwood products by the National Hardwood Lumber Association, together with the grades adopted for the various softwood lumber products by the principal lumber associations and descriptions of typical grading rules of several of the most important commercial species.

DISEASES OF PLANTS.

Report of [New York] bureau of plant industry, G. G. ATWOOD (*N. Y. State Dept. Farms and Markets, Ann. Rpt., 1 (1918), pt. 1, pp. 114–130*).—Portions of this report relate to inspection of shipments and orchards; to measures for preventing the spread of the white-pine blister rust and the alternate currant rust; and to the control of apple scab. A summary is given of work undertaken by the plant pathologist, and an account of new insects and diseases appearing during the year.

Report of the division of plant pathology and botany, J. MATZ (*Ann. Rpt. Insular Expt. Sta., Dept. Agr. and Labor, Porto Rico, 1919, pp. 33–36*).—Brief notes are given on the occurence of a large number of diseases.

Preliminary to more extended studies of some of them, an investigation has been conducted on the root diseases of sugar cane which showed that Rhizoctonia and Pythium may produce decay of roots in a few days, while Marasmius did not appear to produce any appreciable change in growing roots. A species of Sclerotium was also studied and found capable of infecting leaf tissue and to cause decay of rootlets. Some attention was paid to means of transmission of yellow stripe disease, and of 35 plants inoculated by injecting juice from diseased plants, all but 4 remained free from infection.

The author reports the presence of a black spot of grapefruit which is due to a slow-growing fungus, and that *Phytophthora terrestria* was found in association with foot rot of citrus trees. Studies are also reported of the rots of coconut, avocado, and cacao, which are apparently due to a species of Diplodia.

Mycologist's report on a visit to Trinidad, W. NOWELL (*Proc. Agr. Soc. Trinidad and Tobago, 19 (1919), No. 6, pp. 141–159*).—This is an account of a study during the period December, 1918, to February, 1919, of conditions in Trinidad as regards matters connected with diseases of economic plants. such as blight of sugar cane and root disease of coconuts, the latter of which he believes to be caused by fungi closely allied to Marasmius or Odontia. Factors named and discussed as locally influencing disease include cultural and soil conditions, climate, froghopper insect attack, rotation, sanitation, and manuring.

North American rusts on Cyperus and Eleocharis, F. D. KERN (*Mycologia, 11 (1919), No. 3, pp. 134–147*).—In addition to lists of known hosts, descriptions are given of *Puccinia canaliculata, P. antioquiensis, P. cyperi, P. eleocharidis,* and *Uromyces eleocharidis;* of the new combination *P. cyperi-*

tagetiformis; and of the new species *P. abrepta*, *P. liberta*, and *Uredo incomposita*. Five names are excluded for reasons given.

Treatment of cereal seeds by dry heat, D. Atanasoff and A. G. Johnson (*Jour. Agr. Research* [*U. S.*], *18* (*1920*), *No. 7, pp. 379–390, pls. 2*).—In investigations carried on at the Wisconsin Experiment Station for the control of certain seed-borne diseases of cereals, the authors conducted a series of experiments in which barley, wheat, rye, and oats were subjected to high temperatures.

It was found that seed of these cereals, especially of good quality and well dried, was able to withstand protracted exposures to dry heat at comparatively high temperatures. It was shown that the bacterial blight of barley due to *Bacterium translucens* and the bacterial blight of oats caused by *Pseudomonas avenæ* may both be eliminated by exposing the infected seed to dry heat at temperatures which will still leave the seed viable. Experiments also indicated that a number of seed-borne diseases, such as wheat scab (*Gibberella saubinetii* and *Fusarium* spp.) and spot blotch of barley (*Helminthosporium sativum*), may be practically eliminated by the dry heat treatment, while net blotch of barley due to *H. teres* and the stripe disease (*H. gramineum*) and Helminthosporium blotch of oats caused by *H. avenæ sativæ*, as well as loose smut of barley and smuts of oats, are markedly reduced by the dry heat treatment without materially injuring the germination of the seed.

Broken stem disease of rye, F. Detmers (*Mo. Bul. Ohio Sta.*, *4* (*1919*), *No. 8, pp. 262, 263, figs. 2*).—The author describes a disease of rye which has heretofore not been reported in Ohio. The disease is said to be due to a species of Mycosphærella, and is characterized by a uniformly grayish-brown discoloration of the lower internodes of the rye stalk. When split open, the stalk shows that the infection causes a brown dry rot appearance of the inside, and the cells are packed with the threads of the fungus. Stalks which do not break, bend and lie almost flat. The heads are not directly affected, but fail to develop to normal size, some of them producing no normal kernels while others may produce a few plump ones. Attention is called to this disease in order that additional information may be obtained regarding it.

" Take-all " disease of wheat in Virginia, W. J. Schoene (*Quart. Bul. Va. State Crop Pest Comm.*, *1* (*1920*), *No. 4, pp. 22, 23*).—An account is given of the discovery, in September, 1919, of wheat take-all in a field in Roanoke County. A brief note relates also to the introduction of this disease into this country, supposedly from Australia, as flag smut was found in the same field in Illinois.

Studies on the winterkilling of wheat, R. Schander and E. Schaffnit (*Landw. Jahrb.*, *52* (*1918*), *No. 1, pp. 1–66, fig. 1, pls. 4*).—This is a report of investigations bearing upon the freezing and frost-killing of plants; chemical-physiological processes, and physical changes in the cell contents under low temperatures; the cold resistance of certain wheat varieties; and predisposing factors in winterkilling.

The new sugar cane disease, J. A. Stevenson (*Rev. Agr. Puerto Rico*, *1* (*1918*), *No. 1–2, pp. 18–25, figs. 2*).—A mosaic disease of sugar cane is described as showing a whitish-yellow mottling or variegation, the appearance and progress of which may cause it to be confused with other diseases or anomalies of the sugar cane plant, such as chlorosis. The variety Otaheite is specially susceptible to this disease. No causal parasite has been demonstrated. The disease is propagated in cuttings. Selection of uninfected stock for planting is of prime importance. Resistance to the disease is also important.

[The yellow stripe or sugar cane disease], F. S. Earle (*Ann. Rpt. Insular Expt. Sta., Dept. Agr. and Labor, Porto Rico, 1919, p. 18*).—The author reports that the yellow stripe or sugar cane mosaic disease, which was only recently discovered (E. S. R., 38, p. 150), has spread throughout Porto Rico so that probably four-fifths of the cane fields are now more or less invaded by it. Directions for the control of the disease have been given (E. S. R., 41, p. 347), and it is said that these recommendations are being adopted by many plantations with gratifying results.

Root disease in sugar cane (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 10 (1919), p. 452*).—This is a brief discussion of the report by Nowell noted on page 643.

Diseases [and other injuries in Montana orchards], A. L. STRAUSZ (*Bien. Rpt. Mont. Bd. Hort., 10 (1917–18), pp. 11–16, figs. 2*).—In a report including important insect pests and diseases of plants, it is stated that apple leaf scab (*Venturia pomi*) is prevalent throughout the western portion of Montana, causing losses annually amounting to thousands of dollars. It is said to be the most destructive plant disease in the State.

Fire blight (*Bacillus amylovorus*) was more prevalent in 1918 than in 1917, but does not now seriously injure the fruit industry. Root gall and crown gall (*Pseudomonas tumefaciens*) are present in some degree in all orchards, dwarfing and stunting the trees affected. Silver leaf does comparatively little damage. Root rot or crown rot (cause not definitely known) is showing its effects in many orchards, but generally on few trees.

Physiological troubles, as briefly discussed, include winter injury, malnutrition, and brown bark spot.

Spraying experiments for black spot and powdery mildew, J. M. WARD and P. H. THOMAS (*Agr. and Stock Dept. Tasmania, Bul. 74 (1918), pp. 10*).—As a result of a series of experiments rather preliminary in character, it was found that the best results as regards control of apple black spot came from the use of Bordeaux mixture at the 4:4:40 strength if applied when most of the bloom buds were well open, earlier or later sprays being much less effective.

Powdery mildew was controlled more effectively by using commercial atomic sulphur than by the use of lime sulphur. There is no resulting injury to the foliage, if applied in proper strength, when the bud scales are first released and again when the trees are in leaf; that is, 1 lb. for 10 gal. water for the first spray, and 1 lb. for from 10 to 16 gal. for the second, according to the condition of the trees following the first spraying.

Cedar rust and cedar eradication, W. J. SCHOENE (*Quart. Bul. Va. State Crop Pest Comm., 1 (1920), No. 4, pp. 15–18*).—An outline is given of progress in the removal of cedars from the vicinity of orchards, and in general of cooperation for protection against infection of apple by the rust fungus in the counties of Augusta, Albemarle, Botetourt, Clarke, Frederick, Rockingham, and Shenandoah.

Diseases and insect troubles of raspberries and their control, A. FRANK (*Washington Sta., West. Wash. Sta. Mo. Bul., 7 (1920), No. 11, pp. 188–192, figs. 6*).—A popular description is given of a number of the more common diseases and insect pests of the raspberry, and suggested methods are given for their control so far as definite means are known.

Treatment for Cycloconium of olive, A. ROLET (*Jour. Agr. Prat., n. ser., 32 (1919), No. 20, pp. 413–415*).—This is a review of work by several authors on treatment for black scale (*Lecanium oleæ*), fumagine (*Fumago vagans, F. salicina, Capnodium olæophilum*) and Cycloconium (*C. oleaginum*) of olive.

The fungus diseases of the avocado, J. B. RORER (*Bul. Dept. Agr. Trinidad and Tobago, 18 [1919], No. 3, pp. 132, 133, pls. 2*).—The only serious disease attacking the fruit of the avocado up to this time is the so-called anthracnose.

This is said to be caused by a fungus closely related to or identical with the organism previously noted as causing anthracnose of mango (E. S. R., 35, p. 153).

Avocado die-back is of frequent occurrence throughout the Colony. This is due to *Diplodia cacaoicola*, which also causes die-back of cacao and of rubber. It is thought to enter by way of very young tissues through wounds made by the anthracnose fungus, growing then rapidly down the tree and killing back the shoots for a distance of two or three feet from the tip. The same fungus also attacks budded avocados.

A summary of the citrus canker investigation in south Alabama, G. L. Peltier (*Proc. Gulf Coast Hort. Soc., 4 (1918), pp. 21, 22*).—Having contributed articles (E. S. R., 39, pp. 757, 857) regarding the susceptibility and resistance of citrus to canker and the overwintering of the canker organism, the author states that during the past two years an attempt has been made to perfect a method for the consistent isolation of the canker organism from the soil, in order to determine whether it will live in the soil, and if so, under what conditions. Studies are in progress on the life history and other matters regarding the organism.

Pink disease of citrus, H. A. Lee and H. S. Yates (*Philippine Jour. Sci., 14 (1919), No. 6, pp. 657–673, pls. 7, figs. 2*).—This is an account of the discovery (in 1917) and investigation of an apparently serious stem and branch disease of citrus trees in three localities in the Philippines. The name pink disease, employed elsewhere to indicate the result of infection by *Corticium salmonicolor*, is accepted here also.

Local investigation and trial of control measures have given almost complete control of the disease at Lamao. Copper sprays, though effective against the disease, kill also the fungus parasites which keep down the scale insects. Lime sulphur, which is efficacious against both this disease and the scale insect, is recommended. It is effective at a strength of 1:40, but at 1:35 causes no injury to the foliage. The time for spraying varies with the season. Removal of affected portions is effective when combined with the spraying treatment, and the treatments are simple and comparatively inexpensive, supposedly combining readily with other methods in a general plan against other diseases on other plants.

Fungus diseases [in Ceylon, 1918] (*Year Book Planters' Assoc. Ceylon, 1918, pp. 79–81*).—Brown bast of rubber trees is thought to be present throughout the rubber-producing area, though still most abundant in the drier regions. This trouble is thought to be identical with the disease of the same name in the Federated Malay States and in Java. The treatment recommended is to scrape the diseased bark until the latex begins to flow, and then apply Brunolinum at full or half strength in order to kill the portions of the cortex in which the nodules develop. Around abnormal streaks and patches such a nodule-producing center or abnormal region is usually a group of altered latex vessels. It is stated that though nodules follow brown bast, altered particles may be produced without the previous existence of brown bast.

The root disease caused by *Poria hypobrunnea* is still comparatively rare, most cases of root trouble being due to brown root disease (*Fomes semitostus*, *F. lignosus*), and *Ustulina zonata*. It is now said that the disease attributed to a Poria in the Federated Malay States is really due to a Fomes, which has been named *F. pseudoferrens*. This has not been found in Ceylon. An extensive outbreak of *F. lignosus* occurred on stumps and logs of *Erythrina umbrosa*. *Botryodiplodia theobromæ* causes the death of large numbers of tea bushes near decaying Hevea stumps.

Moldy rot on the tapped surface of rubber trees may be due locally to *Phytophthora faberi*, differing from the disease given the same name in the Federated Malay States. The bark decay now most prevalent in some rubber districts is that caused by the claret colored canker. A new root disease of tea (*F. applanatus*) has been noted on one estate. The fungus is said to be a common saprophyte in Ceylon, but to have been found to cause root disease of *Acacia decurrens* and *Casuarina montana*, and in South India, of coffee.

P. hypolateritia, the common root disease fungus of tea in up- and mid-country districts, has been found to spread to tea from stumps of Albizzia.

A leaf disease of coconut is briefly described as occurring in one district.

Inspection for pine blister rust, W. J. SCHOENE (*Quart. Bul. Va. State Crop Pest Comm., 1 (1920), No. 4, pp. 14, 15*).—White pine blister rust inspection, which was continued during the summer months of 1918–19, is here briefly discussed with its bearings upon the production of white pines within the State of Virginia, which are estimated to be worth about $10,000,000.

Treatment for chlorosis, G. ARNAUD (*Rev. Vitic., 51 (1919), No. 1325, pp. 325–330, figs. 2*).—A treatment for chlorosis in trees of different kinds consists in piercing the trunk or larger branches with a specially adapted form of punch which removes the portion cut out, and then filling the orifice so made with a mixture of powdered iron sulphate and oil. The restorative effect is said to continue for several years.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Specific, subspecific, and varietal categories of insects and the naming of them, W. L. MCATEE (*Ent. News, 31 (1920), Nos. 2, pp. 46–55; 3, pp. 61–65*).

On the insecticidal principle of Chrysanthemum cinerariifolium (insect powder), I, R. YAMAMOTO (*Ber. Ōhara Inst. Landw. Forsch., 1 (1918), No. 3, pp. 389–398*).—The author has "isolated a yellow, transparent, neutral sirup named pyrethron as an insecticidal principle which has the saponification value 216 and iodin value 116. Pyrethron is easily saponified with alcoholic potash and loses its insecticidal power after saponification. The power of this pyrethron is reduced by heating or when exposed to the air for a long time. Pyrethron has the power to control the germination of bacteria in addition to a strong insecticidal power. In the saponification product, I have isolated higher alcohols having the formulas $C_{21}H_{34}O$ (M. P. 199° C.) and $C_{27}H_{46}O$ (M. P. 175–179°) and fatty acids, liquid and solid, having the formulas $C_{16}H_{18}O_2$ and $C_{16}H_{32}O_2$ (palmitic). Judging from these results, it is probably true that the insecticidal principle of the insect powder is ester."

Report of the entomologist, H. T. FERNALD (*Agr. of Mass., 1918, pp. 87–94*).—This report deals with the occurrence of the more important insects of the year. Mention is made of serious injury in several places by red bugs (*Heterocordylus malinus* and *Lygidea mendax*), which have gradually increased during the last five years. The saddled prominent (*Heterocampa guttivitta*) defoliated beech, maple, and other trees, being limited almost exclusively to the hilltops in western Massachusetts, and extending from about as far north as Brattleboro, Vt., southward as far as Chester and Becket. The squash borer was unusually abundant, in one field observed all but 4 of 400 plants having been destroyed by it.

Report of the imperial entomologist, T. B. FLETCHER (*Sci. Rpts. Agr. Research Inst. Pusa, 1918–19, pp. 86–103, pls. 3*).—This report deals with the work of the year, including the occurrence of the more important insect pests, that with bees, lac, silk, etc. Among the important enemies mentioned are a gracilariid (*Acrocercops* sp.), the larvæ of which mine under the bark of cotton at Pusa, causing the layer of bark to peel off the entire stem and even from the leaf stalks.

[Economic insects in Tasmania], H. M. NICHOLLS (*Agr. and Stock Dept. Tasmania, 1918, Buls. 77, pp. 9, figs. 4; 78, pp. 12, figs. 8; 1919, Bul. 83, pp. 6*).—These bulletins relate to The Codling Moth and the Powdery Mildew, Scale Insects, and the Woolly Aphis (*Eriosoma lanigera*), respectively.

Wheat insect survey for 1919, E. C. COTTON (*Mo. Bul. Ohio Sta., 4 (1919), No. 8, pp. 241–245, fig. 1*).—This is a report upon the wheat insect survey made during 1919 in continuation of that of the previous year (E. S. R., 39, p. 863), in order to obtain definite data on which to base sowing dates for the fall seeding.

The survey showed the jointworm to have been the most important insect damaging wheat, as was the case the previous year. Wheat fields in but three of the counties visited were free from the ravages of this pest, the damage varying from 1 per cent or less in some counties in the eastern part of the State to a maximum of 89 per cent in Miami County, with an average of 31.4 per cent for the 39 counties reported. No cultural or other method of control for the jointworm has been devised, since early and late planting do not yield consistent results either in nearby fields the same year nor in consecutive years in the same field.

The Hessian fly situation changed somewhat from the previous year, the greatest damage occuring farther east, particularly in the counties of Lorain, Medina, Wayne, Ashland, Richland, Knox, Huron, Erie, and Sandusky. The highest infestation was in Ashland, where counts showed an infestation of 37.9 per cent of the straws, the average for the State being 14.4 per cent. The importance of closely observing fly-free dates in seeding is emphasized, it being pointed out that the Hessian fly is very delicate in structure and a very large proportion of the flies appear and disappear within a week. Examinations of "dates of sowing" plats made during the fall of 1918 showed a decrease in the percentage of plants infested from 76 on September 2 to none on September 30 or later in Miami, from 100 per cent on September 1 to none on October 1 in Lorain and the southern part of Erie County, and a reduction to none on September 28 in Sandusky County.

The imperative necessity for cooperation in control work is called to attention, and also the fact that Miami County after suffering very severe losses from the fly for five or six successive seasons was ridded of the insect in a single season by cooperative procedure. As a control measure for the jointworm it is recommended that all wheat fields should be carefully raked while damp with dew or rain and the rakings together with down straw should be run through the separator or thrown out to the pigs or chickens.

Insects attacking squash, cucumber, and allied plants in Connecticut, W. E. BRITTON (*Connecticut State Sta. Bul. 216 (1919), pp. 33–51, pls. 8, figs. 9*).—This popular summary of information follows the plan of the account given in an earlier paper (E. S. R., 20, p. 1048) but has been revised, enlarged, and wholly rewritten.

Two new termites from Arizona, T. E. SNYDER (*Proc. Ent. Soc. Wash., 22 (1920), No. 2, pp. 38–40*).

Brief descriptions of new Thysanoptera, X, R. S. BAGNALL (*Ann. and Mag. Nat. Hist., 9. ser., 4 (1919), No. 22, pp. 253–277; abs. in Rev. Appl. Ent., Ser. A, 7 (1919), No. 12, p. 543*).—Among the 25 species here described as new are *Frankliniella varicorne* collected on *Petalostemon purpureum*, and *Euthrips cameroni* from injured wheat stems, both in Saskatchewan, Canada. The genus Limphysothrips is erected.

Sulphur fumigation for the control of mealy bug (Pseudococcus bakeri) on grapevines in the vineyard, R. L. NOUGARET (*Mo. Bul. Dept. Agr. Cal., 9 (1920), No. 1-2, pp. 26-31; also in Cal. Cult., 54 (1920), No. 6, pp. 191, 198*).—This is a summary of information on the control of *P. bakeri* by burning sulphur under the tent.

An account of this pest by the author has been previously noted (E. S. R., 40, p. 650). It is pointed out that on grape it has two distinct broods which do not overlap as when it lives on citrus and pear. "One brood, the first of the year, hatches in June and is the progeny of the overwintering larvæ; the other, the second brood of the year, hatches during September and October. After hatching, the larvæ remain in the ovisac until the following spring. . . . Therefore, it is only necessary to conduct the fumigation with the object of destroying the larvæ without taking the eggs into consideration."

The author has found that where sulphur wicks are used approximately 5 oz. are required for 100 cu. ft., and if the tent volume is 250 cu. ft., covering 4 vines and making 3 fumigations per hour per tent, the cost is 8½ cts. per vine. When refined lump sulphur is used approximately 6 oz. are required for 100 cu. ft., and for a tent of 250 cu. ft., covering 4 vines and making 2.5 fumigations per hour per tent, the cost would be 5.7 cts. per vine. Since this method of control is practically an eradication it is thought to be the most economical.

The fumigator is warned against fumigating with sulphur while the vines are in an active growing state or during the daytime. Care should be taken that the temperature does not reach too high a point, etc.

A new species of Matsucoccus from pines in California, F. B. HERBERT (*Proc. Ent. Soc. Wash., 21 (1919), No. 7, pp. 157-161, figs. 14*).—*Matsucoccus fasciculensis*, taken from within the fascicles of digger pine (*Pinus sabiniana*) and yellow pine (*P. ponderosa*) needles in California, is described as new.

A new genus and species of coccid from Loranthus, H. MORRISON (*Proc. Ent. Soc. Wash., 21 (1919), No. 9, pp. 197-202, pl. 1*).—Under the name *Macrocepicoccus loranthi* n. g. and n. sp. the author describes a form collected on *Loranthus* sp. at Georgetown, British Guiana.

The peach tip moth (Laspeyresia molesta), W. W. FROGGATT (*Agr. Gaz. N. S. Wales, 30 (1919), No. 12, pp. 891, 892*).—This pest, which first appeared in suburban gardens in New South Wales in 1909 and was thought to be the peach twig moth, has been definitely determined to be the oriental peach moth (*L. molesta*). It has spread rapidly and is now one of the important pests in the Gosford and Newcastle areas, and the author considers it only a matter of time before it will become established throughout the orchard districts of Australia. The pupa is said to be parasitized by *Gambrus stokesi*.

The green clover worm a pest of soy beans (Plathypena scabra), L. B. SMITH (*Quart. Bul. Va. State Crop Pest Comm., 1 (1919), No. 3, pp. 8, figs. 4*).—This is a brief report of observations by the author, together with a review of the literature. This worm is said to have caused serious injury to soy beans throughout eastern Virginia during the season of 1919, and other legumes, including Lima and snap beans, alfalfa, and clover, were injured to some extent. Reports from other States indicate that the outbreak of this pest extended over the greater portion of the Atlantic coastal plain from Maine to Florida.

The injury is caused by the worms eating the leaves and occasionally the blossoms, usually only the softer tissues of the leaves being destroyed. The injured blossoms become brown in color and later drop off the plant.

In controlling the pest, soy beans when grown in rows for seed purposes may be sprayed with 1.25 lbs. of arsenate of lead and 2 lbs. of lime to 50 gal.

of water at any time without danger of injuring the plants. If preferred, a dusting mixture consisting of 5 lbs. of powdered arsenate of lead and 50 lbs. of land plaster or air-slaked lime may be used. It is pointed out that it is unnecessary that the sprays reach the underside of the leaves, and the ordinary potato sprayer will serve the purpose if the spray boom is raised several inches above the tops of the plants.

There is no practical method for protecting soy beans which have been sown broadcast to be used for forage. If the pest becomes abundant on clover and alfalfa, the crop should be cut at once. On snap beans the pest may be controlled in the same way as on soy beans grown in rows, the arsenical to be applied just previous to the opening of the blossoms.

Reference is made to the accounts of this pest by Chittenden (E. S. R., 13, p. 665), Britton (E. S. R., 20, p. 1048), and Hill (E. S. R., 39, p. 865.

On the life history and habits of a peach leaf miner (Ornix sp.), C. Harukawa and N. Yagi (*Ber. Ōhara Inst. Landw. Forsch., 1 (1918), No. 3, pp. 325–333, pl. 1*).—The authors deal with a leaf miner of the peach in Japan which somewhat resembles *Ornix geminatella*, a leaf miner of the apple in the United States reported upon by Haseman (E. S. R., 35, p. 359).

This peach leaf miner has not as yet caused any great damage in Japan, but the authors are of the opinion that under favorable conditions it might become a source of severe injury, since there are four complete and one partial generation each year. While its distribution in Japan has not as yet been determined, it is known to occur in Tokyo and Okayama Prefectures.

The eggs are laid singly on the underside of the leaf, largely close to the midrib. They hatch in from three days to about two weeks, and the larva immediately begins mining the epidermis on the underside of the leaf at the point where the egg is cemented to it. At about the middle of the fourth stage the larva leaves its original mine and builds a new completely closed cell with the leaf, in which it conceals itself and continues feeding on the epidermis. When full grown the larva either spins a yellowish cocoon at one end of the mine, or it leaves the mine, folds over the edge of the leaf, and fastens the edge to the leaf surface and builds its cocoon in the recess thus made. In addition to the peach, its favorite host, the species attacks plum, cherry, Japanese flowering cherry, apple, and apricot.

Control measures include the burning of all fallen leaves to which the cocoons of the last brood may be attached and other rubbish in the orchard, stripping off the rough outer bark of the tree trunks, and the application of pyrethrum decoction oil emulsion for the adults.

The serpentine leaf miner of the peach, a species of Lyonetia, C. Harukawa and N. Yagi (*Ber. Ōhara Inst. Landw. Forsch., 1 (1918), No. 3, pp. 335–348, pl. 1*).—The authors here report studies of the life history, habits, and natural enemies of a species of Lyonetia that is an important enemy of the peach in Japan. The species is thought to be distinct from the European pest, *L. clerkella*, under which name it was considered in an account of its life history by Kuwana and Takachiho in 1911.[1]

This leaf miner is widely distributed in Japan, feeding exclusively on the leaf tissue of the peach. There are seven broods each year, the adults of the last brood wintering over. There are three larval instars. Several undetermined hymenopterous parasites have been reared by the authors.

Lepidoptera at light traps, W. B. Turner (*Jour. Agr. Research* [*U. S.*], *18* (*1920*), *No. 9, pp. 475–481, fig. 1*).—This is a report of observations by the Bureau of Entomology of the U. S. Department of Agriculture made at Hagerstown,

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[1] Rpt. Imp. Agr. Expt. Sta. Tokyo, 38 (1911), pp. 99–102.

Md., during 1918, in continuation of work in 1916, an account of which has been previously noted (E. S. R., 39, p. 560).

The collections were made on 28 full nights between May 14 and September 13. "The total of 3,152 moths recorded for that period embraces 60 odd species. Of this total, 2,200 or 69.8 per cent are males, and 952 or 30.2 per cent are females. Tabular data give an itemized account of the species, the numbers taken of each sex, and the percentage of males and females. In two species, *Noctua c-nigrum* and *Euparthenos nubilis*, the two sexes are equally represented; and of those species of which at least five individuals were taken three show a preponderance of females." A table giving the percentage of gravid females shows that of 952 moths dissected, 736 or 77.3 per cent, were gravid, these constituting 23.35 per cent of all moths captured. Of the 11 genera of arctiids represented, all the females of 9 genera were gravid. Among the noctuids, gravid females made up 100 per cent in 8 genera.

Records of temperature and humidity presented in tabular form have led the author to conclude that the night-flying habits of the moths are but little influenced by these factors. On the other hand, such meteorological conditions as strong winds, rain, or fog materially restrict flight.

Data as to the total collection of moths, arranged by hours of collection, are presented. In the first three periods, ending at 10 p. m., there were taken 325 females, or 35 per cent of the total of 952 females and 40 per cent of the total of gravid females. In the same period, 424 males, or 19 per cent of the total males, were killed. From 10 p. m. to 4 a. m. the percentage of gravid females declined, while that of the males and spent females increased.

Some 60 odd species, representing 10 families, were taken in collections at Hagerstown in the summer of 1918. Of these at least 20 are of economic importance, and several others are likely to prove serious pests if circumstances favor them.

Further studies of Sorosporella uvella, a fungus parasite of noctuid larvæ, A. T. SPEARE (*Jour. Agr. Research* [*U. S.*], *18* (*1920*), *No. 8*, *pp. 399–439*, *pls. 6*).—This is a detailed report of investigations conducted by the author, of the Bureau of Entomology of the U. S. Department of Agriculture, a preliminary account of which has been previously noted (E. S. R., 36, p. 757). The work has been summarized by the author as follows:

"The presence of *S. uvella*, an entomogenous fungus, is recorded for the first time in America. The previous association of Sorosporella with the Entomophthorales is shown to be erroneous, and the proper position of the organism, among the verticilliacious Hyphomycetes, is designated.

"The reproductive bodies are thick-walled resting spores or chlamydospores and thin-walled conidia, the latter being herein definitely associated with the life history of the organism for the first time. It is shown that yeastlike vegetative cells, existing within the blood of infected insects, are ontogenetically related to other phases in the development of the organism. There is an ingestion of these vegetative cells by certain of the blood corpuscles (phagocytosis), the process being apparently followed by the destruction of the phagocytes. This phenomenon has, up to the present time, been overloked by those investigators who have studied the fungus diseases of insects.

"The organism is readily cultivated on artificial nutrients and exhibits two quite different types of growth when grown on favorable media. In certain cases, both when the fungus was grown on media and when the resting spores were placed in a moist chamber, fruiting structures of the Isaria type developed. No perfect or ascigerous condition has been observed. The disease caused by the organism is readily transmitted to healthy insects, and in laboratory experiments a mortality of from 60 to 90 per cent may be readily obtained."

A list of 24 references to the literature is included.

A new noctuid from Arizona (Lepidoptera, Noctuidæ, Acronyctinæ), H. G. DYAR (*Insecutor Inscitiæ Menstruus, 7 (1919), No. 10–12, p. 188*).

New moths from Mexico (Lepidoptera, Noctuidæ, Hadeninæ), H. G. DYAR (*Insecutor Inscitiæ Menstruus, 7 (1919), No. 10–12, pp. 162–164*).

The larva of Xanthopastis timais again, H. G. DYAR (*Insecutor Inscitiæ Menstruus, 7 (1919), No. 7–9, p. 149*).

The occurrence of malaria parasites in Anopheles crucians in nature: Percentage of infection of A. quadrimaculatus and latest date found infected in northern Louisiana, B. MAYNE (*Pub. Health Rpts. [U. S.], 34 (1919), No. 25, pp. 1355–1357*).—The author reports the finding under natural conditions of *A. crucians* infected with Plasmodium. In malaria investigations in a lumber settlement in northern Louisiana, 5 of 20 specimens of *A. crucians* were found to be infected.

Descriptions of hitherto unknown larvæ of Culex (Diptera, Culicidæ), H. G. DYAR (*Insecutor Inscitiæ Menstruus, 7 (1919), No. 10–12, pp. 161, 162*).

A new subgenus of Culex, H. G. DYAR (*Insecutor Inscitiæ Menstruus, 7 (1919), No. 7–9, p. 150*).

A revision of the American Sabethini of the Sabethes group by the male genitalia, H. G. DYAR (*Insecutor Inscitiæ Menstruus, 7 (1919), No. 7–9, pp. 114–142, pl. 1*).

District of Columbia Diptera: Asilidæ, W. L. MCATEE and N. BANKS (*Proc. Ent. Soc. Wash., 22 (1920), Nos. 1, pp. 13–20; 2, pp. 21–33, figs. 2*).

Life history of Eublomyia calosomæ, a tachinid parasite of Calosoma beetles, C. W. COLLINS and C. E. HOOD (*Jour. Agr. Research [U. S.], 18 (1920), No. 9, pp. 483–497, pls. 2*).—This is a report of biological studies by the Bureau of Entomology of the U. S. Department of Agriculture of *E. calosomæ*, a native tachinid parasite, which is known to occur in New England as far north as York County, Me., and Merrimack County, N. H.; as far west as Worcester County, Mass.; and as far south as Plymouth County, Mass., and Providence County, R. I. Since first reared from *Calosoma calidum* by Burgess in 1896, it has been reared from adults of *C. sycophanta*, *C. frigidum*, and *C. calidum* collected in the field. Larvæ of *C. sycophanta*, *C. frigidum*, and *C. scrutator* have been exposed to the flies in breeding experiments, but without results.

There are two full generations per year and a partial third under favorable conditions. The eggs hatch in from 3 to 24 hours, the larvæ develop in from 9 to 12 days, and the pupæ in from 9 to 18 days, making it possible for a generation to develop fully in from 20 to 25 days. It hibernates in the second larval instar within the body cavity of Calosoma adults, in the soil.

During the seasons from 1915 to 1918, over which period a study was made of its life history, the highest parasitism upon *C. sycophanta* was 3.4 per cent in 1916 and an average of 4.4 per cent upon *C. calidum* for a period of years. "The abundance of the parasite of the summer generations occurs at a time when adults of *C. sycophanta* and other species of Calosoma are beginning to enter the earth for a period of dormancy followed by hibernation. This doubtless tends to limit the opportunity for increase under present conditions. The data thus far accumulated show that the parasite has not yet caused a serious handicap to the abundance and usefulness of *C. sycophanta* in New England."

A list of 8 references to the literature is included.

Studies on the fruit flies of Japan.—I, Japanese orange fly, T. MIYAKE (*Bul. Imp. Cent. Agr. Expt. Sta. Japan, 2 (1919), No. 2, pp. 85–165, pls. 9, figs. 5*).—Reports of the presence of an orange-infesting fruit fly in the orchards of

Kiushu led to investigations by the Department of Agriculture and Commerce in 1914. Two species of fruit flies were found to occur in the orange groves of the invaded districts of Kiushu. The first of these, a species known as very injurious and identified by Kuwana in 1911[1] as *Dacus ferrugineus*, has been found by the author to represent a new species to which he gives the name *D. tsuneonis;* the other, a hitherto undescribed species, the author describes as new under the name *D.* (*Chætodacus*) *bezzii*. *D. tsuneonis* was found by the author to be a formidable pest to the orange, but no positive proof was found that *D. bezzii*, which occurs abundantly, was a source of injury. Mention is made of the occurrence of *D.* (*Chætodacus*) *ferrugineus dorsalis* of Hendel, a very injurious orange-infesting species, in Formosa.

The studies reported relate particularly to *D. tsuneonis* (pp. 92–146), its internal and external anatomy, life history, habits, etc. This is followed by descriptions of *D. bezzii* and four other new species which were discovered in the course of the study, namely, *Hypenidium polyfasciatum*, *Acidia kagoshimensis*, *A. marumoi*, and *Gastrozona japonica*. The author's studies show *D. tsuneonis* to occur in at least five of the Prefectures of Kiushu, to which island it is strictly limited. Its injury usually amounts to from 10 to 20 per cent of the whole crop, and where it is severe it reaches 50 per cent. The fly usually appears at the end of June, accelerating in emergence during July and diminishing at the end of August, but its appearance is met with until September, rarely to October.

By experiments conducted in which marked flies were liberated the maximum distance traveled was 720 yds. within three days, the minimum being 360 yds. within six days.

Since the eggs are deposited in the juice sacks or between them or between the pulp and the rind, thick-skinned oranges (navel oranges, pomeloes, etc.) are usually exempt from the attack of the fly, the ovipositor possibly being unable to reach the pulp. In nature, infested oranges with a single puncture are most abundant, those with two punctures are not extremely rare, but with three punctures they are very rare. The author's observations indicate that there are from two to six eggs laid in each puncture. The period of incubation of the egg has not been determined, though in one case they did not hatch until the eighth day after deposition. The maggots usually appear at the beginning of October and by the end of the month or at the beginning of November become full grown.

"When the larva has nearly eaten up the contents of the originally infested carpel, it enters the adjoining carpel and then to the next, according to the size of the fruit, activity of the larva, and the duration of the larval period. From two to ten carpels are infested by a single maggot. In kumquats the boring is irregular, and usually the seeds are eaten." The oranges begin to fall in October and continue until November. The larvæ soon leave the fruit and enter the ground to a depth of 1 or 2 in. and pupate.

No parasites of importance have as yet been found. Capturing the adult flies by a special apparatus, collecting and treating infested fruit, and picking up the pupæ are practiced in infested localities. The author's recommendations are as follows: "Adults should be captured as early as possible in the season of their appearance; infested fruits should be picked up as quickly as possible; infested oranges should be utilized as raw material for the preparation of citric acid; the construction of storehouses for oranges should be improved; and a full knowledge of the present species should be diffused among local orchardists."

A bibliography of 32 titles is appended.

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[1] Rpt. Imp. Agr. Expt. Sta. Tokyo, 38 (1911), pp. 109–112.

Work and parasitism of the Mediterranean fruit fly in Hawaii during 1918, H. F. WILLARD (*Jour. Agr. Research* [*U. S.*], *18* (*1920*), *No. 8, pp. 441–446*).—This is a report by the Bureau of Entomology of the U. S. Department of Agriculture on the status of the parasitism of *Ceratitis capitata* in Hawaii by *Opius humilis*, *Diachasma tryoni*, *D. fullawayi*, and *Tetrastichus giffardianus* in continuation of the yearly records (E. S. R., 40, p. 62). It shows the extent of parasitism during 1918, the amount of infestation by *C. capitata* for the same period, and, for the purpose of comparison, gives general summaries of parasitism and infestation during 1916 and 1917.

While the parasitism by both *D. fullawayi* and *T. giffardianus* was less in 1918 than in 1917, the total percentage of parasitism for the last year, on account of the increased effectiveness of *D. tryoni*, had increased 8.3, making the total parasitism for 1918, 55.8 per cent of all the fruit-fly larvæ under observation. The data recorded show that the value of these parasites as destroyers of fruit flies has consistently increased each year since their introduction, until in 1918 they caused the destruction of considerably more than half of all the fruit flies developing in fruits about Honolulu. "This great decrease in the numbers of this pest has been of direct benefit to the people of Hawaii by greatly decreasing the infestation of the fruits less susceptible to fruit-fly attack, since this class contains the majority of fruits of commercial value. It has been of value also to the fruit growers of the mainland United States by greatly decreasing the danger of the introduction of the fruit fly there."

European frit fly in North America, J. M. ALDRICH (*Jour. Agr. Research* [*U. S.*], *18* (*1920*), *No. 9, pp. 451–473, pl. 1, figs. 7*).—This is a detailed report of biological investigations during the years 1914 to 1916 by the Bureau of Entomology of the U. S. Department of Agriculture at Lafayette, Ind., of *Oscinis frit*, an insect which attacks both winter and spring wheat every year over the whole geographical range of the crop and at times has done considerable damage. A summary of the present status of knowledge of this pest abroad by Collin has been previously noted (E. S. R., 40, p. 860). In this country biological observations of it were first made by Garman in Kentucky in 1889, when he found the stems of young wheat infested, and a similar observation was made by Fletcher at Ottawa, Canada, about the same time.

The author's studies have led to the conclusion that the forms recorded from this country under the names *O. pusilla*, *O. nitidissima*, *O. carbonaria*, *O. variabilis*, *O. nigra*, and *O. soror* are all synonyms of *O. frit*.

"In the commonest form of injury minute maggots occur in young stems of wheat close to the ground. They are easily distinguished from the larvæ of the Hessian fly . . . from the fact that the larva is in the center of the stem and crawls actively when removed, whereas the Hessian fly larva is between the bases of the leaves and is extremely inactive. The *O. frit* larva often causes the central leaf to die and turn brown, those about it remaining green; this the Hessian fly larva never does."

The region of greatest abundance in this country corresponds closely with that in which winter wheat is grown, from the Great Lakes to the Ohio River and westward about as far as the Missouri. At Lafayette it winters in the larval stage in winter wheat.

Following the emergence of this brood as adults in the spring there are normally four summer broods. The data presented show an average period from adult to adult in the first summer brood of 49.7 days for 35 individuals; for the second brood, 30.3 days for 41 individuals; for the third brood, 28.5 days for 21 individuals; and for the fourth brood 45.5 days for 2 individuals.

From the records obtained the author finds the division of the entire period in its life cycle by percentage to be as follows: Preoviposition 14, egg 11, larva 50, and pupa 25. The fly deposits its eggs on the grains and grass, usually on the very young tender shoots, in which case the larva enters the shoot and feeds downward in the middle, but sometimes upon or within the glumes just after heading, in which case it eats out the soft young kernel. A very characteristic symptom of infestation in young shoots of all kinds is the dying of the central leaf while the others around it remain green. Cereals, including wheat, rye, emmer, barley, and oats, sowed in rows in the garden in late spring were infested in the order given, the wheat being much the worst infested, and oats hardly at all. The author's investigations have led to the conclusion that *O. frit* as it occurs in this country does not normally feed upon the oat at all, but that occasional individuals, when compelled, are able to do so. Sweepings show that from early summer onward the fly is much more abundant on blue grass lawns than anywhere else, but sweepings on blue grass that has begun to head, or is in a later stage, yield very few specimens, indicating that the presence of young shoots is the attraction. Sweepings on timothy in unmixed stand yield almost no specimens at any time, indicating that it is a plant unattractive to *O. frit.* A list of the known food plants includes 20 species, on 7 of which it has been reared by the author.

Due to the difficulty in identifying it, the most that can be said of *O. frit* is that it appears to be highly parasitized by minute Hymenoptera. In regard to remedies, it is stated that the similarity of frit fly attack on wheat to that of the Hessian fly indicates that a solution of the one trouble may carry the other with it. "Wheat sown early in the fall is more infested than that sown later, so the recommendation of late sowing to escape the Hessian fly will be equally applicable for *O. frit*, but with this difference, that with the Hessian fly the possibility of infestation entirely ceases at a certain date, but with *O. frit* the chances decreases regularly until cold weather. Wheat sown in the late spring is more infested than that sown early. Continuous cropping in wheat appears to make no difference with the fly, which migrates freely for considerable distances."

A list of 24 references to the literature is included.

Biology of some Coleoptera of the families Colydiidæ and Bothrideridæ, F. C. CRAIGHEAD (*Proc. Ent. Soc. Wash., 22 (1920), No. 1, pp. 1–13, figs. 32*).

Descriptions of new North American ichneumon flies, R. A. CUSHMAN (*Proc. U. S. Natl. Mus., 55 (1919), pp. 517–543, fig. 1*).—The genera Chrysopoctonus and Cryptohelcostizus are erected and 14 species described as new. The species of economic importance are *Habrobracon politiventris*, *Ænoplex polychrosidis*, *Spilocryptus exannulatus*, and *Glypta mutica* from the grape berry moth at North East, Pa.; *Chrysopoctonus patruelis* from *Chrysopa* sp. at Alhambra, Cal.; *Helcostizus rufiscutum* from *Phlœsinus* sp. at Cypress Point, Monterey, Cal.; *Cryptohelcostizus rufigaster* from *Chrysobothris mali* and *Agrilus angelicus* at Harold, Cal.; and *Mesoleius balteatus* from *Ametastegia glabrata*, at Wenatchee, Wash.

Descriptions of seven new species of Opius (Hymenoptera-Braconidæ), A. B. GAHAN (*Proc. Ent. Soc. Wash., 21 (1919), No. 7, pp. 161–170*).—The species here described as new are *Opius cupidus*, thought to parasitize *Pegomyia hyoscyami* at Brooklyn, N. Y.; *O. turneri*, reared from dipterous leaf miners on cowpeas at Greenwood, Miss.; *O. downesi*, from the apple maggot at Victoria, B. C.; *O. richmondi* and *O. lectus*, collected on blueberry "barrens" at Cherryfield, Me., and may be parasitic on the apple maggot; and *O. trinidadensis* and *O. cereus* from *Anastrepha* spp., Trinidad, British West Indies.

Revision of the parasitic chalcidoid flies of the genera Homalotylus Mayr and Isodromus Howard, with descriptions of two closely related genera, P. H. Timberlake (*Proc. U. S. Natl. Mus., 56 (1919), pp. 133–194, pls. 4*).—The genera Anisotylus and Brethesia are erected, and 11 species and 2 subspecies are described as new. The species of economic importance described as new include *Homalotylus mexicanus*, reared from material of *Ceroputo yuccæ* on agave, Guadalajara, Mex.; *H. quaylei*, reared from citrus mealy bug material from Sicily, Italy, probably from a coccinellid host; *H. africanus*, reared from Pseudococcus material, undoubtedly from a coccinellid larva, Cape Town, South Africa; *H. cockerelli*, reared from larvæ of *Hyperaspis trimaculata* associated with *Dactylopius confusus* on Opuntia or collected at Dactylopius colonies on Opuntia at Brownsville, Tex., etc.; *H. affinis*, reared from larvæ of *Hyperaspis osculans* in colonies of *D. confusus*, at Uplands, Cal.: *H. brevicauda*, reared from a scymnine larva associated with *Orthezia* sp. on *Hymenoclea monogyra*, Durango, Mex.; *H. hyperaspidis*, reared from larvæ and pupæ of *Hyperaspis undulata*, Utah and California; *Anisotylus similis texanus*, collected on sorghum heads at San Antonio, reared from a pupa of *Hyperaspis bigeminata* at Austin, and from an undetermined coccinellid larva at Brownsville, Tex.; *A. similis utahensis*, reared from larvæ of *Scymnus americanus* and *S. lacustris* at Murray and Salt Lake City, Utah; and *Brethesia latifrons*, reared from material of the cottony cushion scale, Mendoza, Argentina.

Polyembryony and sex, J. T. Patterson (*Jour. Heredity, 10 (1919), No. 8, pp. 344–352, figs. 10*).—The author reports studies of the polyembryonic broods of three species of parasitic Hymenoptera, namely, *Copidosoma gelechiæ*, which is found in the larvæ of the Solidago gall moth (*Gnorimoschema salinaris*); *Paracopidosomopsis floridanus*, which oviposits in the egg of the cabbage looper; and *Platygaster* sp., which is found in the larvæ of two dipterous gall makers of the mountain cedar (*Sabina sabinoides*), namely, *Walshomyia texana* and *Rhopalomyia sabinæ*. Much of the data on the sex ratios of the three species is presented in tabular form.

Preliminary note on the life period of the bulb mite (Rhizoglyphus echinopus), N. Yagi (*Ber. Ōhara Inst. Landw. Forsch., 1 (1918), No. 3, pp. 349–360, pl. 1, figs. 8*).—In this paper the author deals principally with the anatomy of the species. It molts twice in both sexes, the external sexual differences appearing in the adult. "The span of one generation is about 10 days in August, 15 days in July, and 20 days in June. Difference of the length of life depends chiefly upon temperature, which remarkably affects the embryonic development. Both canna and tree peony (*Pæonia moután*) are found to be the host of this mite."

Tropical fowl mite in the United States, with notes on life history and control, H. P. Wood (*U. S. Dept. Agr., Dept. Circ. 79 (1920), pp. 8, figs. 2*).—This is a report of studies of *Liponyssus bursa* Berlese, two outbreaks of which have occurred in the United States, one at Beltsville, Md., and the other at Raymond, Ill. At both of these places measures were taken to eradicate the pest, which, it is thought, if once established would prove to be as serious a menace to the poultry industry as is the roost mite, and possibly more so. This species is reported to occur in Africa, China, India, Mauritius, Comoro Islands, Bahamas, and South America. It was first reported in this country from Beltsville, Md., on April 2, 1917, and at Raymond, Ill., January 24, 1919. The source of the infestation could not be determined in either case.

"*L. bursa*, the tropical fowl mite, is considerably smaller than *Dermanyssus gallinæ*, the roost mite, and it moves about much faster. The posterior end of the abdomen in the female is bilobed in most specimens. The hairs on the dorsum are longer and more prominent than in *D. gallinæ*, and the legs are smaller. *L. bursa* is found in the nests and on the fowls. *D. gallinæ* is found in cracks of the roost and building, in nests, and only sparsely on fowls. *D. gallinæ* does not deposit eggs and molt on its host; *L. bursa* does. *D. gallinæ* feeds at night; *L. bursa* may feed both night and day."

The eggs, which are laid either on the host or in the nest, hatch, off the host, in three days. Upon hatching out the larva does not feed but molts in about 17 hours, whereupon it is ready to feed. The first stage nymphs molt in from 1 to 2 days. The molting period of the second stage nymphs was not determined.

In addition to the domestic fowl it is reported to occur upon the starling, the sparrow, and one or two other hosts, and to attack man. In examinations by the author the mite was found on English sparrows on one farm adjoining the original infestation in Illinois, and in the locality studied another mite was more or less abundant in some of the English sparrow nests examined.

It is said that continuous heavy infestation of the tropical fowl mite often results in death of the fowl, and that setting hens will leave their nests if not relieved of the infestation.

"Since this mite feeds and breeds on poultry, it could be introduced readily into the country and disseminated through the shipment of infested stock. It may be stamped out either by dipping fowls in sulphur, soap, and water, or by giving them a heavy dusting with sulphur. At the same time the houses, especially the nests, floors, and dropping boards, must be treated with carbolineum. A continuous war against the English sparrow should be instituted in a locality where the mite is discovered. Nests should be robbed and destroyed by fire and the nesting places eliminated."

FOODS—HUMAN NUTRITION.

Report on food conditions in Germany, E. H. Starling (*London: Govt. 1919, pp. 48, pls. 4*).—This report is based on observations made during two visits to Germany shortly after the armistice, the first confined to four cities in the occupied territories and the second to Berlin and Kattowitz in Upper Silesia. Data are included on the prewar food conditions in Germany, the effect of war on these conditions, the actual food supplied to the population during the war, illicit food trading, the effects of the war on the health of the working classes, the middle class and children, the effects of food shortage on efficiency and output, the mental condition of the population, and the outlook as regards food for the year 1919–20.

It is shown that, while before the war Germany produced 85 per cent of the total food consumed by her inhabitants, the cutting-off of the importation of feeding stuffs and the application of home-produced artificial manures to the manufacture of explosives resulted in a reduction of the effective quantity of live stock by 55 per cent and a diminution of the soil productivity by 40 per cent. These factors are considered largely responsible for the serious shortage of food in Germany.

"The effects of these conditions, deficient production and defective distribution, have been felt by the consuming classes, forming two-thirds of the population, and this chronic starvation has caused a great loss of body weight and diminished resistance to disease. The death rate has increased and the birth rate diminished, so that the number of deaths now considerably exceeds the number of births, and the population is diminishing in numbers. Underfeeding has caused not only inefficiency in work and a diminution of national output, but has also had a marked effect on the mentality of the people, who are listless, apathetic, and hopeless. . . . There is a widespread increase of tuberculosis, the deaths from this disease having increased, according to the locality, from 2.5 to 6 times. The lack of milk has seriously affected the health of the children. In all classes rickets and associated diseases are of common and increasing occurrence."

The immediate needs of Germany are summarized as food for her workers, concentrated feeding stuffs and manures for her agriculture, and raw materials for her manufacturers. Of the first, the estimated need for importation in 1920 is to the value of at least 8,000,000,000 calories.

Statistical material on which this report is based is presented in a series of appendixes including, in addition to statistical tables and charts, memoranda on Agricultural Conditions in Germany, by A. P. McDougall, and on Agricultural Statistics, by C. W. Guilleband.

The food ration of the adult man, L. Binet (*Presse Méd. [Paris], No. 29 (1919), pp. 281, 282*).—This is a résumé of a report made by J. P. Langlois at a conference of the Society of Food Hygiene (France) on the food requirements of man, as based on observations during the war and on laboratory researches.

Mess officers' manual (*Philadelphia: Lea & Febiger, 1919, pp. 192, pls. 2, figs. 3*).—This manual was prepared by officers of the Division of Food and Nutrition of the Medical Department, U. S. Army, to facilitate the work of camp nutrition officers, but is considered to be for the most part equally useful for stewards and dietitians of civil institutions. It consists of chapters on the composition of foods, selection and inspection of foods, storage of foods, digestion and absorption of foods, nutritive value of foods and their use in the diet, kitchen economy and mess management, the duties of mess officers, and a glossary.

Nutrition during childhood, P. Nobécourt (*Presse Méd. [Paris], No. 65 (1919), pp. 653–655*).—This is a general discussion of the food requirements of children from 2.5 to 15.5 years of age. The ill effects of undernutrition are illustrated by the condition of the children of Lille after three years of inferior rations during the war. The rations were said to be of low calorific value, rarely exceeding 1,600 calories, and to be deficient in assimilable protein and fat. The result was an almost universal retardation of growth and development, not only physical but psychic. A large percentage of the population from 10 to 20 years of age showed tuberculosis lesions.

Principles of general physiology, W. M. Bayliss (*London and New York: Longmans, Green & Co., 1918, 2. ed., rev., pp. XXIV+858, figs. 263*).—In this revision of the volume previously noted (E. S. R., 34, p. 777) a few changes have been made, the bibliography has been brought up to date, and a new section on the transport of carbon dioxid in the blood has been added.

The food industry, K. von Buchka (*Das Lebensmittelgewerbe. Leipzig: Akad. Verlagsgesell., 1918, vol. 3, pp. XL+678, figs. 60; 1919, vol. 4, pp. XI+412, figs. 22*).—In these volumes of the treatise on the food industry, the first volume of which has been previously noted (E. S. R., 32, p. 854), the subjects and contributing authors are as follows:

Vol. 3, Introduction on The Importance of Chemical Research in the Food Industry, by T. Paul (pp. XVII–XL); Grains, Milling Products, Starches, Bread and Pastry Materials, and Legumes, by R. Fritzweiler (pp. 5–306); Spices, by E. Küster (pp. 311–362); and Drinking and Mineral Waters, by L. Grünhut (pp. 367–678).

Vol. 4, Milk and Milk Products, by Teichert (pp. 1–134); Sweetening Agents, by W. Lange (pp. 139–228); and Beer, by G. Bode (pp. 233–412).

Food chemistry in 1917, J. Rühle (*Ztschr. Angew. Chem., 32 (1919), Nos. 4, Aufsatzt., pp. 9–14; 6, pp. 17–21; 8, Aufsatz., pp. 27–31; 10, Aufsatz., pp. 36, 37*).—This is an extensive survey of the literature of 1917 on food chemistry. Following a review of special legislation in Germany regarding substitutes, adulterants, etc., necessitated by war conditions, the literature is reviewed under the headings of general chemistry of foods; apparatus and methods; milk and cheese; butter, edible fats, and oils; flour and flour substitutes; sugar and confections; fruits; spices; coffee, cocoa, tea, and tobacco; wine; beer; preservatives; and fermentation chemistry.

The food value of milk, E. L. Ferry (*Connecticut State Sta. Bul. 215 (1919), pp. 30, figs. 14*).—This bulletin is essentially a transcript of an address delivered by the author at the annual meeting of the Connecticut Dairymen's Association in January, 1919. The material consists largely of a survey of the work of the station during the past few years on the constitution of the proteins, and the constitution and nutritive value of milk. Many charts and tables from the contributions which have been noted previously are here reproduced.

Milk: Its importance as food, J. F. Lyman (*Ohio Agr. Col. Ext. Bul., 15 (1919–20), No. 3, pp. 2–20*).—"In this bulletin an attempt is made to set forth the superior quality of milk as a food, and to emphasize its great importance as a factor of safety in the diets of all human beings, infants, children, and adults, whether sick or well."

Utilization of the shark for food and leather, A. Rogers (*Jour. Indus. and Engin. Chem., 12 (1920), No. 3, p. 293*).—The author outlines the possibilities in the utilization of sharks—the skins to be used in the manufacture of leather, the livers rendered for their oil, and the flesh used as food and fertilizer stock. About 50 per cent of the weight of the shark is said to be edible, the fresh meat when boiled, broiled, or baked closely resembling halibut or sword fish.

Experiments with soy bean meal as a substitute in the Army ration, A. W. Dox (*Proc. Iowa Acad. Sci., 25 (1918), pp. 517–519*).—Two tests of the suitability of soy bean meal as a substitute in the Army ration are reported.

In one case soy bean meal was used in making soup in the proportion of 1.5 oz. to a pint of boiling water. By adding beef stock and proper seasoning a very palatable soup resulted. A soy bean flour of practically the same composition as the meal was used in bread making in the proportion of 20 per cent soy bean flour and 80 per cent wheat flour. The product was darker and smaller than the corresponding wheat bread, but was of excellent flavor.

The energy content of extra foods, II, C. G. and F. G. Benedict (*Boston Med. and Surg. Jour., 181 (1919), No. 14, pp. 415–427*).—Continuing the investigation previously noted (E. S. R., 40, p. 269), determinations are reported of the energy content of food materials often eaten between meals, at incidental light meals, picnics, spreads, etc. The data presented include the calorific value, as measured with the bomb calorimeter, of olives and olive products, sardines, nuts, potato chips, doughnuts, and confectionery (such as caramels, nougatines, chocolate almonds, peppermints, and a large number of candies popularly sold in portions costing one cent each). Partial reports are given on cream cheeses, popcorn, crackers, and pretzels. Weights and sizes are given of various lump sugars, and the weights of average helpings of granulated sugar.

The conclusion of the authors in the previous communication, that the energy value of the ordinary portions of the so-called extra foods is not without significance and should not be disregarded, is confirmed by the additional data here presented as shown by the following examples.

An average sized olive furnished from 8 to 10 calories, extra large olives from 14 to 15 calories, and small olives, including stuffed varieties, 4 or 5 calories. An average sized can of American sardines furnished about 500 calories, with from 15 to 26 gm. of protein. About 150 calories were furnished by 10 half-walnuts and 60 calories by 10 peanut kernels. Doughnuts averaged about 200, educator wafers 11, and pretzels 19 calories apiece. Individual caramels averaged over 45, chocolate almonds about 13, and large nougatines 83 calories. The penny candies, popular with children, furnished on the average from 50 to 60 calories each, the average teaspoonful of sugar from 29 to 35 calories, and an ordinary lump of sugar about 29 calories.

In conclusion emphasis is laid upon the necessity of not underestimating the energy needs of the growing boy and girl as reflected in their seemingly insatiable appetites.

Diseases of nutrition and infant feeding, J. L. Morse and F. B. Talbot (*New York: Macmillan Co., 1920, 2. ed., rev., pp. X+384*).—In this second revised edition of this volume, the aim of which has been to present a detailed description of the scientific basis of rational infant feeding and of its application in the method of infant feeding taught in the Harvard Medical School, new data have been added bringing the literature up to April 1, 1918. The subject matter is treated under the sections of physiology and metabolism, breast feeding, artificial feeding, diseases of the gastrointestinal canal, and diseases of nutrition. In the last-named section the diseases discussed include rickets, infantile scurvy, spasmophilia, and acidosis.

Treatment of the intolerance of infants for milk by the subcutaneous injection of milk, E. Weill (*Presse Méd.* [*Paris*], *No. 60* (*1919*), *pp. 601–604*).—The author is of the opinion that the ordinary digestive disturbances of infants, not traceable to specific organic lesions or authentic infections of the gastrointestinal tract, are due to an intolerance for milk. This intolerance is of the nature of a slight specific anaphylaxis toward the milk of the particular species employed. While it may often be avoided by substituting cow's milk for breast feeding or vice-versa, it has been found possible to overcome it entirely by injections of the milk in question.

In the author's practice the injections are made subcutaneously in the abdominal region in progressively increasing doses, starting with 0.5 cc. of the milk followed in an hour by 2 cc. and three hours later by from 5 to 10 cc. Rigorous aseptic conditions should be practiced in the preparation of the milk, which may be boiled or heated for 20 minutes to 110° F. The reaction is accompanied by slight local disturbances and often by a slight lowering of the temperature in the case of human milk and a slight elevation of the temperature with cow's milk.

Reports are given showing the results of this treatment in 8 cases selected from a much larger number, all of which responded to the treatment. The effects are said to be lasting, no return of the trouble having been noted during six months of observation.

Studies in the adaptation of an artificial food to human milk.—II, A report of three years' clinical experience with the feeding of S. M. A. (synthetic milk adapted), H. J. Gerstenberger and H. O. Ruh (*Amer. Jour. Diseases Children, 17* (*1919*), *No. 1, pp. 1–37, pl. 1, figs. 24*).—This paper supplements the one previously noted (E. S. R., 34, p. 558) by further details and slight modifications in the preparation of the artificial milk now called S. M. A., and by chemical observations made on 311 infants fed with this milk. From these observations the following general conclusions are drawn:

"It is possible to obtain an excellent nutritional result, according to our present standards, without the aid of butter fat in the food, if the food is similar to breast milk in its protein, carbohydrate, salt, and water content, if the substituting fat contains an adequate amount of fat-soluble growth factor, and if the fat is similar to breast milk fat in other respects, namely, saponification number, iodin number, Reichert-Meissl number, and melting point, and if, further, an antiscorbutic is given with S. M. A., so long as it is manufactured as at present; that is, over the route of pasteurization or sterilization. The feeding of S. M. A. was not accompanied by the development of rickets, spasmophilia, or anemia in full-term normal infants.

"It is possible to feed, with excellent nutritional results, a large group of full-term, normal infants with S. M. A. without any qualitative change for as long a time as it is customary to keep infants at the breast. This accomplishment represents a distinct advance in practical infant feeding, inasmuch as it establishes a marked simplification of feeding, especially from the standpoint of the general practitioner and the general welfare station, and as a result of the good nutritional results obtained it represents further a substantial means for the lessening of sickness among infants, and, indirectly, of improving the health and strength of the nation."

Calcium metabolism of infants and young children and the relation of calcium to fat excretion in the stools.—II, Children taking a mixed diet, L. E. HOLT, A. M. COURTNEY, and H. L. FALES (*Amer. Jour. Diseases Children, 19 (1920), No. 3, pp. 201–222*).—In this continuation of the investigation previously noted (E. S. R., 42, p. 555), the calcium metabolism of older children taking a mixed diet was investigated along similar lines with the following results:

The average absorption of calcium oxid by children on a mixed diet with adequate calcium intake was 0.055 gm. per kilogram of body weight, an amount somewhat lower than that of infants taking modifications of cow's milk. The daily excretion was correspondingly higher, averaging 0.87 gm. The average intake of calcium was lower than that in infants, the average in 79 cases being 0.108 gm. per kilogram. When the intake was 0.09 gm. per kilogram or less the percentage of the calcium intake absorbed averaged only 20.3, while when the intake exceeded 0.09 gm. per kilogram the percentage absorbed averaged 40.4. This is thought to indicate that an intake of at least 0.09 gm. of calcium oxid per kilogram is necessary to insure a good absorption by children taking a mixed diet. The best absorption of calcium occurred when the food contained from 0.03 to 0.05 gm. of calcium oxid for every gram of fat and when the fat intake exceeded 3 gm. per kilogram. The absorption of calcium was greatly increased by the addition of chalk mixture to the diet, but not by the addition of calcium acetate or phosphate.

A very small intake of calcium decreased the absorption to the point of a negative balance in some cases. The age of the child irrespective of the weight had no relation to the calcium absorption. The excretion of calcium in the stools bore some relation to the excretion of fat as soap, but none at all to the excretion of total fat. The calcium percentage of total solids in the stools was less than that of infants on modified milk and was lower in acid than in normal or constipated stools. The soap percentage of total solids followed on the average the variation in the calcium percentage of total solids.

Calcium absorption and excretion in chronic intestinal digestion, rickets, and recovery from rickets followed the same lines as in the preceding study, a low absorption and high excretion being the rule until recovery, when the reverse took place. Cod liver oil again increased the calcium absorption. The substitution of vegetable fats for milk fat had no effect upon the calcium metabolism.

The effects of a diet of polished and of unpolished rice upon the metabolic activity of Paramecium, M. D. FLATHER (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 36 (1919), No. 1, pp. 54–61, fig. 1*).—The investigation reported in this paper was undertaken to discover the effects of the presence and absence of the vitamin contained in rice upon the metabolic activity of Paramecium, with a view to determining whether this vitamin is so far-reaching in its effects as to alter the metabolism of unicellular organisms.

Comparisons were made of the division rate of single individuals of pure strains of Paramecium for 11 days in media consisting, respectively, of 3 drops of distilled water with 1 drop of 1 per cent malted milk solution, 2 drops of distilled water with 2 drops of 1 per cent rice water made from polished rice, and 2 drops of distilled water with 2 drops of 1 per cent unpolished-rice water. It was found that the division rate with polished rice was broken and irregular, with unpolished rice fairly regular, and with malted milk very regular in daily increase in the number of divisions. "From these results it is evident that unpolished rice is much less favorable than malted milk as a culture medium for Paramecium, and that polished rice is quite inadequate for maintaining the vitality of the organisms. It seems probable that the essential factor lacking in the diet of polished rice is the vitamin removed in the process of polishing."

Further experiments conducted along similar lines to determine the effect of orange juice upon the metabolic activities of the Paramecium in the same media are reported. The orange juice was found to stimulate slightly the metabolic activities of the organism in polished rice, but to have absolutely no effect upon the division rate of those in unpolished rice. From these results it may be concluded that orange juice has not a powerful influence upon the metabolic activities of Paramecium.

Botulism: Preliminary report of a study of the antitoxin of Bacillus botulinus, E. C. DICKSON and B. M. HOWITT (*Jour. Amer. Med. Assoc., 74 (1920), No. 11, pp. 718–722*).—The experiments recorded, which were performed during the year 1917–18, are presented as a preliminary report in order to call attention to certain facts established in regard to the production and value of botulinus antitoxin.

The literature on the production of botulinus antitoxin is reviewed, and the method employed by the authors is outlined briefly. This consisted of inoculating 3 goats over a period of several months with three virulent strains of *B. botulinus*. Two of these strains, strains III and IV, were recovered from chickens poisoned with home-canned string beans (California) and with home-canned corn (Oregon), and the third strain, strain VI, from cheese (the Nevin strain). The potency of the antitoxins obtained was defined as approximately 3,000, 5,000, and 600, respectively, the number indicating the respective antitoxic equivalent in 1 cc. of serum as tested against one test dose of its homologous serum. In all the experiments the toxins and antitoxins were mixed in vitro before being injected, and all inoculations were given subcutaneously, guinea pigs being used for the standardization.

On testing these antitoxins against the action of the toxins of seven strains of *B. botulinus*, including the three from which the antitoxins were prepared, it was found that the antitoxins of strains III and IV were alike in their action and showed a protective power against three other toxins as well as their own. The antitoxin of strain VI, while not protecting against that of III, and IV, protected against its own toxin and two others. From these results the authors conclude that there are at least two types of *B. botulinus* which are distinct so far as their toxin-antitoxin relationships are concerned, as has been previously noted by Burke (E. S. R., 42, p. 260).

Experiments to test the effect of the administration of specific antitoxin at varying intervals after the injection of toxin were conducted upon guinea pigs. It was found that it requires at least four times as much antitoxin to neutralize one test dose of toxin in vivo as in vitro, thus necessitating the use in experiments in vivo of four or five times the antitoxin equivalent of one test dose of toxin calculated from experiments in vitro. When slightly more than one test dose of toxin was injected into guinea pigs, the lives of the animals were saved when the antitoxin was given within 18 hours after the toxin, although the onset of symptoms was not prevented even when given 12 hours after. An excess of antitoxin beyond that required to neutralize the amount of toxin administered was found to afford no greater protection than amounts just sufficient for neutralization. When a smaller amount of toxin was injected, the length of time during which the antitoxin might exert its influence was lengthened. When the toxin was administered by feeding as well as by subcutaneous injection, the administration of antitoxin was of value if given within 24 hours.

In discussing the therapeutic value of botulinus antitoxin it is pointed out that, as it is impossible to determine quickly what type of toxin is responsible for the poisoning in a given outbreak, it will be necessary to have a polyvalent antitoxin if satisfactory results are to be obtained. Since the amount of toxin ingested is unknown, large doses of the antitoxin should be given intravenously following the usual precautions for the administration of serum.

Epidemic gastroenteritis due to food poisoning, J. D. Comrie and G. A. Bird (*Jour. Roy. Army Med. Corps, 33 (1919), No. 5, pp. 374–390, figs. 6*).—A brief account is given of an epidemic of severe gastroenteritis occurring in one of the convalescent depots of the British Expeditionary Forces in France in July, 1918, affecting from 300 to 400 men and causing 7 deaths.

A bacillus showing the reactions of *Bacillus aertrycke* was recovered from the spleen in all the fatal cases, as well as from the feces of 6 other patients. The source of this bacillus was thought to be some meat pies made of meat cooked on the previous day and warmed up before serving, the heat of cooking probably not being sufficient to sterilize the meat and to prevent the multiplication of the bacteria with which it was infected.

The first symptoms of the disease were of violent gastrointestinal irritation followed by cardiac failure. The temperature rose at once to about 102° F., remained high for two or three days, and then fell to normal or subnormal. In the fatal cases death followed in less than ten days. Recovery in the remaining cases was extremely slow, some of the subjects being incapacitated for several months.

ANIMAL PRODUCTION.

Quantitative studies on the growth of the skeleton of the albino rat, H. H. Donaldson (*Amer. Jour. Anat., 26 (1919), No. 2, pp. 237–314, figs. 24*).—To study the absolute and relative growth of the separate bones or natural group of bones of albino rats and to provide norms or reference values for the skeletal parts of experimental rats, the skeletons of 106 normal individuals, ranging in age from birth to 500 days, were macerated, cleaned, disarticulated, and dried. The data are intended to supplement and in part to replace the data on the rat skeleton given in the author's memoir (E. S. R., 40, p. 546).

It was found that the appendicular and the axial skeletons maintained a fairly constant ratio of weights from about the time of weaning (body weight of 15 gm.) until the end of the record. The rate of growth of the cranium is only about 40 per cent of that of the entire skeleton. The hind limbs grow very rapidly from birth to weaning, but after that point the growth of the appendages is so closely correlated with body growth that it was found possible to compute the body weight accurately from the weight of one of the long bones, and to determine the body length by multiplying the sum of the length of two long bones by a constant factor.

Contrary to what is considered to be common opinion, it was found that the long bones are relatively more slender at maturity than at birth.

Changes in the weights of the various parts, systems and organs in albino rats kept at birth weight by underfeeding for various periods, C. A. Stewart (*Amer. Jour. Physiol., 48 (1919), No. 1, pp. 67–78*).—The author reports data as to body development and weights of internal organs and body parts of 8 albino rats killed at birth and of 15 rats kept strictly at birth weight (by reduction in the opportunities for suckling) and killed at an average age of 16 days. Under normal feeding the body weight would have trebled in this period.

During maintenance the head increased about 45 per cent in weight, with a compensating decrease in the trunk and extremities. The body length increased 11 per cent and the tail became much elongated. The viscera increased 46 per cent, the integument 25 per cent, and the musculature and skeleton (together) 6 per cent. The rest of the body (mainly fat, body fluids, and some small glands) decreased 59 per cent. The testes made the greatest relative increase of any organ (374 per cent) while the ovaries remained practically constant (increase of 5 per cent). In these rats the testes, epididymides, eyeballs, brain, kidneys, spleen, and heart increased more markedly at the expense of the rest of the body than in the case of the rats in the author's previous experiment (E. S. R., 42, p. 468), which were held less rigorously at maintenance for 3 weeks.

Recovery of normal weight in the various organs of albino rats on refeeding after underfeeding from birth for various periods, C. M. Jackson and C. A. Stewart (*Amer. Jour. Diseases Children, 17 (1919), No. 5, pp. 329–352*).—Data are presented as to the development of the body parts and internal organs of 31 rats maintained at nearly constant weight from birth until the age of 21, 45, or 66 days, then given ample feed for several weeks, and finally autopsied at body weights of 25 to 75 gm. The controls were normally grown individuals of the same body weights.

In general, the body parts and organs recovered their normal size particularly in the groups re-fed to the higher body weights. In the 25 gm. group the body (nose to anus) length was somewhat above and the integument below normal, while the intestines were longer than in the controls. In all groups the skeleton, brain, spinal cord, and thymus were somewhat subnormal in weight, but the empty stomach and intestines were heavier than in the controls in most cases.

The spleen and particularly the testes showed a tendency to overcompensatory growth in the earlier stages of refeeding and a retardation later. Results from the ovaries were irregular.

The effects of inanition in the young upon the ultimate size of the body and of the various organs in the albino rat, C. M. Jackson and C. A. Stewart (*Jour. Expt. Zool., 30 (1920), No. 1, pp. 97–128, figs. 5*).—The authors report the results of additional inanition and refeeding experiments, which differ from the series noted above in that the re-fed animals were not killed until they had attained their maximum body development. Besides groups of rats underfed from birth until the ages of 3, 6, or 10 weeks, data are included from other groups in which reduced feeding began at weaning (3 weeks) and continued in some individuals for nearly a year, and in most cases for upward of 20 weeks. The treatment was made as severe as was experimentally possible, and over half the rats perished from starvation, 70 surviving to adult life.

The re-fed rats that survived grew variably, but failed to reach the adult size of controls from the same litters. The authors, therefore, take issue with Osborne, Mendel, et al. (E. S. R., 32, p. 165; 34, p. 562) as to the possibility of permanent loss of growth capacity through quantitative reduction in diet, and point out that the Osborne and Mendel rats were put on restricted diet at a relatively late age and were allowed to increase in weight somewhat during underfeeding.

Autopsies were made on 28 of the test rats and 17 normal animals of corresponding body weight. The test animals were slightly subnormal in body length, tail length, and in weights of skeleton, integument, and musculature. The viscera weighed slightly above the normal. In general the bodies of these permanently stunted rats were normally proportioned.

The ovaries were distinctly subnormal in size, and this fact is suggested as the cause of a marked loss of fertility noted in the females when mated to normal males. On the other hand, the testes and epididymides were definitely above normal in size. Males on the average were more stunted than the females.

Effects of inanition and refeeding upon the growth of the kidney of the albino rat, J. A. KITTELSON (*Anat. Rec., 17 (1920), No. 5, pp. 281–297*).—The author reports a quantitative study of the structure of the kidney in several young normal white rats, and in 8 individuals (from one of Stewart's inanition experiments) stunted from birth to the age of 3 or 6 weeks and then killed or re-fed.

During underfeeding, particularly when severe (maintenance at birth weight), the cortex grew much less rapidly than the medulla, but the normal proportions were restored upon refeeding. During the shorter inanition period the formation of new renal (malpighian) corpuscles apparently ceased, although rudimentary corpuscles already present continued to grow and attained a size distinctly above the normal, thereby more than compensating for the deficiency in number. However, between the third and sixth week of underfeeding the formation of new corpuscles was resumed. The corpuscles in the re-fed individuals were larger and more numerous than in the controls.

The author suggests that the disproportionate size of the corpuscles of underfed rats is to be explained by the fact that the blood which is furnished the renal tubules of both cortex and medulla passes first through the corpuscles. The latter thus have a good opportunity to secure nutritive material despite the limited supply.

The relative volumes of the cortex and medulla of the adrenal gland in the albino rat, J. C. DONALDSON (*Amer. Jour. Anat., 25 (1919), No. 3, pp. 291–298, figs. 4*).—The body weights and the amounts of cortical and medullary tissue in the adrenal glands of 17 albino rats killed at varying ages are recorded. The volumes of the cortex and medulla were determined by reconstruction from sections of the fixed gland.

The relative volume of medullary tissue was found to decrease from birth to puberty, and then remain approximately constant. It was higher throughout life in males than in females.

The adrenalin content of the suprarenals of the female white rat, and the changes brought about by thyroid feeding and other conditions, P. T. HERRING (*Quart. Jour. Expt. Physiol., 12 (1919), No. 2, pp. 115–123*).—Observations on 12 thyroid-fed rats and 12 controls are reported.

In normal adult female rats the adrenal glands were 40 per cent heavier than in males of the same body weight, and the adrenalin content was more than twice as great. The adrenalin content was increased during pregnancy.

The feeding of fresh ox-thyroid caused a rapid increase in the weight of the adrenals, due mainly to a hypertrophy of the cortex. Females were less tolerant to thyroid administrations than males, and the increase in the size of the gland was less marked. It is held that the maintenance of health under thyroid feeding is conditioned upon an abundant adrenalin secretion.

The postnatal development of the suprarenal gland and the effects of inanition upon its growth and structure in the albino rat, C. M. Jackson (*Amer. Jour. Anat., 25 (1919), No. 3, pp. 221–289, figs. 10*).—The material for this investigation consisted of the adrenal glands of 56 underfed and 52 control white rats. The rats had all been fed on graham bread soaked in whole milk, the rations being reduced in a series of maintenance and chronic inanition experiments and cut off entirely during acute inanition. The paper includes an account of the organogenesis and histogenesis of the gland and a study of the volumes of cortex and medulla, of parenchyma and vascular stroma, and of cytoplasm and nuclei.

The ratio of cortex and medulla was not materially changed in young rats stunted by underfeeding nor in adults subjected to acute or chronic inanitions, but stunted young rats showed increased vascularization in the inner cortex.

Except in the inner cortical zone the cell nuclei were found to increase only slightly in size in the course of normal growth, but the cytoplasm showed considerable growth. These relations were varied somewhat by underfeeding, the cytoplasm but not the nuclei being reduced in size.

In young rats stunted by underfeeding mitosis was almost completely suppressed. After a week's refeeding cell division had begun again, and in two weeks the normal rate was reestablished.

In stunted young rats the differentiation of liposomes (lipoidal granules or droplets) continued, and the lipochrome pigment was laid down at the normal age. Under extreme inanition the loposomes disappeared from the inner cortical layers of adult rats, but persisted in the outer cortex.

Studies on the mammary gland.—IV, The histology of the mammary gland in male and female albino rats from birth to ten weeks of age, J. A. Myers (*Amer. Jour. Anat., 25 (1919), No. 4, pp. 395–435, figs. 19*).—The author reports histological studies of the mammary glands of young rats from birth until after puberty, in continuation of his previous papers on the gross anatomy (E. S. R., 40, p. 467).

Near the highest part of the nipple there appears a few days after birth a slight excavation, the developing milk-pore, communicating with the intraepidermal part of the primary duct. Complete connection with the primary duct is not established until the sixth week. In later stages the milk-pore occurs near the apex of the cone-shaped nipple.

The milk ducts are for the most part lined with a two-layer epithelium, the outer layer of irregular cells and the inner (glandular) layer of cuboidal or low columnar cells. At 9 or 10 weeks some of the terminal processes show indications of developing into alveoli. The walls of the intra-epidermal part of the primary duct are lined with stratified epithelium similar to that covering the surface of the nipple.

Masses of subcutaneous fat develop soon after birth and increase in size with age. Many of the milk ducts ramify in this fat. The stroma in later stages shows a marked infiltration of fat, but specific stains failed to reveal fat in either the secretions of the milk ducts at the beginning of their normal glandular activity at the 10-week stage or in the epithelial walls.

A slight secretion was noted in the lumina of the milk ducts soon after birth, and in this connection the literature on new-born or witches' milk is reviewed.

Studies on the mammary gland.—V, The effects of inanition on the developing mammary glands in male and female albino rats from birth to ten weeks of age, J. A. Myers (*Amer. Jour. Diseases Children, 17 (1919), No. 5, pp. 311–328, figs. 16*).—The author has examined the mammary glands of a number of Stewart's rats underfed from birth.

In animals held at birth weight and killed at various ages up to 3 weeks, the milk ducts grew very little during the first week and afterwards growth seemed completely inhibited. In animals allowed to reach the normal weight of a week-old rat (about double the birth weight) in from 33 to 65 days, the milk ducts were not so well developed as in normal individuals of the same weight. This was particularly noticeable in the case of a female killed at 65 days (normally the time of puberty and a period of very active proliferation of mammary tissue); her mammary glands differed from those of a new-born rat only in having somewhat more elongated ducts. Approximately the same development of the ducts was shown by another female allowed to reach the normal 2 weeks' weight in 70 days.

The lumen of the primary duct in the underfed rats did not communicate with the milk pore until the tenth week. The nipple grew very little during inanition, being elevated above the surface only slightly in young rats starved for 8 to 10 weeks. The epithelial processes failed to develop much beyond the stage reached at birth, and the sulcus around the base of the nipple remained shallow. The subcutaneous fat in the neighborhood of the milk ducts soon decreased after severe underfeeding.

The oestrous cycle in rats, J. A. Long (*Abs. in Anat. Rec., 15 (1919), No. 6, p. 352*).—The author recognizes four stages, numbered from 0 to 3, in the estrual cycle of rats. In stage 0 the uterine mucosa is greatly thickened as the result of mitoses, in stage 1 the dry cornified layer is exposed by the stripping off of the outer cells, in stage 2 there is a loosening of the cornified cells with the formation of a cheesy secretion, and in stage 3 an invasion by leucocytes, disappearance of the cornified cells, and desquamation of the deeper noncornified layers. The uterus in stages 0 and 1 is distended by a clear fluid that apparently increases the activity of spermatozoa. Copulation takes place during stage 1, and ovulation at the end of 2 or somewhat later.

Five days is considered the normal length of the estrual cycle, but during the first few weeks after puberty and following infertile copulations the cycles are longer, while suckling was found to delay the second post partum ovulation for upward of 40 days.

Stimulation of the cervix of the uterus by inserting a glass rod during stage 1 was found to prolong the following cycle, and it is suggested that the vaginal plug may act in this mechanical way.

See also a previous note (E. S. R., 40, p. 663).

Studies on the ovary of the spermophile (Spermophilus citellus tridecemlineatus) with special reference to the corpus luteum, D. Drips (*Amer. Jour. Anat., 25 (1919), No. 2, pp. 117–184, figs. 29*).—The cycle of changes occurring annually in the ovaries of the spermophile, which ovulates but once a year, are presented with detailed histological descriptions of the corpus luteum. Three stages in the development of the latter are recognized (1) extending throughout most of the gestation period and characterized by a granular secretion in the protoplasm of the luteal cells, (2) from shortly before parturition until about six weeks afterward, in which the luteal cells are filled with lipoid droplets, and (3) the regression phase. The luteal cells are considered to be transformed granulosa cells, the cells of the internal theca contributing only to the connective tissue and vascular network. Ovulation does not take place without coitus, but fertilization is not necessary for the normal development of corpora lutea after ovulation.

Several series of surgical operations on female spermophiles were carried out. Removal of the uterus after conception produced no change in the corpus luteum cycle, but the mamary glands did not enlarge. The removal of both ovaries during early pregnancy caused degeneration of the placentas and fetuses, and abnormal involution of the uterus. During the last half of pregnancy it induced abortion, but involution was normal. That these results were not due to operative trauma is shown by the fact that removal of a single ovary interfered in no way with gestation. Double ovariectomy in nonpregnant animals caused a very gradual functional atrophy of the uterus.

It is concluded that the corpora lutea produce two secretions that influence the changes occurring in the uterus during pregnancy. The early secretion effects the normal implantation and development of the embryo, and the late lipoid secretion helps to bring about normal involution of the uterus.

On the origin of the corpus luteum of the sow from both granulosa and theca interna, G. W. CORNER (*Amer. Jour. Anat., 26 (1919), No. 1, pp. 117–183, figs. 27*).—The author presents a detailed histological study of the changes occurring in the ovary of the sow after ovulation, based upon a large amount of carefuly timed material.

The membrana granulosa was found to remain intact after rupture of the Graafian follicles. Its cells increase in size without division, and their cytoplasm becomes filled with lipoid substances. The author's previous suggestion (E. S. R., 40, p. 663) that the granulosa cells become the larger elements (lutein cells) of the fully formed corpus luteum was confirmed. It was also found that the large lipoid-laden cells of the theca interna, after being increased in number by mitosis and losing many or all of their fatty inclusions, pass into the new formed corpus luteum and become lodged between the granulosa cells throughout the whole structure.

The vaginal closure membrane, copulation, and the vaginal plug in the guinea pig, with further considerations of the oestrous rhythm, C. R. STOCKARD and G. N. PAPANICOLAOU (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 37 (1919), No. 4, pp. 222–245*).—The authors record observations on the estrual cycle of the guinea pig made since their earlier communication on the subject (E. S. R., 40, p. 467), including the discovery of an epithelial overgrowth ("vaginal closure membrane") which covers the orifice of the vagina during pregnancy and between periods of heat.

Ovulation was found to occur every 15 to 17 days in young females and at slightly longer intervals in older individuals. Copulation takes place at a particular stage prior to ovulation when the vagina is filled with a foamy mucous secretion and before the advent of leucocytes. The vaginal plug which forms a few moments after copulation was found to remain in the vagina only a few hours, and to be composed of desquamated epithelial cells and coagulated semen.

Interstitial cells in the gonads of domestic fowl, H. D. GOODALE (*Anat. Rec., 16 (1919), No. 4, pp. 247–250, figs. 4*).—In the thymus and blood of several drakes and in degenerating (cystic) tubules of the testis of a Hamburg cock the author found an abundant supply of cells having the appearance, size, shape, and staining reactions of the granule-laden cells in the hen's ovary to which Boring and Pearl (E. S. R., 39, p. 177) restrict the term "interstitial cells." The cells observed had all the characteristics of eosinophile leucocytes, and the author suggests that the so-called interstitial cells are also such leucocytes, an hypothesis which would explain their sporadic occurrence in the ovary. As to the clear cells of the ovary, which the author identifies with the luteal cells of Pearl and Boring (E. S. R., 40, p. 665), "although no granules have been demonstrated the possibility must be recognized that these cells may be true interstitial cells, at least from the physiological standpoint, i. e., they may furnish an internal secretion such as is demanded of the ovary."

Glycogen in the chick embryo, H. J. Allen (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 36* (*1919*), *No. 1, pp. 63–70, pls. 2*).—Microchemical tests on sections of chick embryos in the early stages of incubation (up to the tenth day) revealed glycogen in small amounts and rather sporadically distributed in the body tissues, but present in the yolk-sac at all stages. It is suggested that the large reserve of energy in the yolk makes extensive storage of glycogen in early embryonic stages unnecessary.

The effect of abnormal temperatures upon the developing nervous system in the chick embryos, F. M. Alsop (*Anat. Rec., 15* (*1919*), *No. 6, pp. 307–331, figs. 13*).—The author reports on the nature and extent of abnormalities developed in chick embryos (up to the age of 3 days) incubated at low (94 to 102° F.) or at high (104 to 108°) temperatures. A total of 303 eggs were used in the experiments, and there were 168 control eggs incubated normally.

Abnormalities were noted in 90 per cent of the high temperature and 67 per cent of the low temperature embryos. The high temperatures caused a rapid development of the optic vesicles and mid-brain, thus producing a large proportion of abnormalities in the brain region. Low temperatures interfered mostly with the formation of the neural tube.

Computing rations for farm animals, E. S. Savage (*Cornell Reading Course for the Farm, No. 117, rev.* (*1919*), *pp. 51–118, figs. 5*).—This constitutes a second revision of Bulletin 321 of the New York Cornell Experiment Station (E. S. R., 39, p. 167), the only change noted being modifications of the table giving fertilizing constituents recovered from feeds consumed.

Stock breeding in Madagascar, G. Carle (*Internatl. Inst. Agr.* [*Rome*], *Internatl. Rev. Sci. and Pract. Agr., 10* (*1919*), *No. 1, pp. 1–11*).—The author discusses cattle raising in Madagascar and the possibility of a more efficient utilization of the extensive grasslands, cattle grazing being the chief industry of the island. Aside from work animals on estates and a few head kept on smaller farms to provide manure, all the cattle (estimated at 7,000,000 head) roam without shelter, receiving a minimum of care from the native herders.

The Madagascar breed is considered a zebu, as it has a hump of variable size on the withers. The cow averages 47 in. in height, the bull 49. The forequarters are well developed, but the trunk is short and the hindquarters defective, the pelvis being narrow and shorter than in any European breed. "Their facility for fattening is astonishing, as is their resistance to bad weather and drought."

General census of cattle in Mauritius, 1918, H. Robert (*Dept. Agr. Mauritius, Statis. Ser., Bul. 4* (*1918*), [*English Ed.*], *pp. 15*).—This bulletin gives the results of a census of cattle in Mauritius in August, 1918.

A slight decrease in working cattle and a large decrease (amounting to a third of the 1914 total) in dairy cattle was noted. The European war having interfered with the normal supply of cattle for slaughter from Madagascar and work animals having increased greatly in value, the demand for meat was satisfied by the slaughter of dairy stock.

The gestation of the carabao, B. M. Gonzalez (*Jour. Heredity, 10* (*1919*), *No. 8, pp. 374, 375, fig. 1*).—Observations made on the herd of Philippine carabao (a variety of the water buffalo, *Bos bubalus* of India and China) owned by the College of Agriculture, University of the Philippines, are recorded.

The gestation period in three cases varied from 318 to 324 days. In two of these cases the cows came in heat again 54 days after parturition. The manifestations of heat are obscure, and the time of estrus was determined by attempting to breed the cows every two days. No previous data on gestation in this form were found in the literature.

Simple rations v. complex rations for poultry, C. H. Burgess and M. E. Dickson (*Michigan Sta. Quart. Bul., 2 (1920), No. 3, pp. 139–141, figs. 4*).—It is recorded that during the four months, November, 1916, to February, 1917, a pen (size not stated) of Single Comb White Leghorn pullets fed a scratch feed of corn and wheat and a mash of bran, oats, and meat scrap laid 97 more eggs than a similar pen fed a more complicated ration in which Kafir corn, barley, buckwheat, and sunflower seed was added to the scratch, and cornmeal, middlings, and gluten feed replaced the oats of the mash. Charts are used to compare the daily production of the two groups and to show the relation between production and temperature.

Meat scraps v. soy bean proteins as a supplement to corn for growing chicks, A. G. Philips, R. H. Carr, and D. C. Kennard (*Jour. Agr. Research [U. S.], 18 (1920), No. 7, pp. 391–398, pl. 1, fig. 1*).—The authors report investigations at the Indiana Experiment Station as to the influence of source and proportion of protein in the feed on the growth and nitrogen metabolism of young White Leghorn chicks. The chicks were 4 weeks old when the experiment began and 30 weeks old when it terminated. Each lot, consisting of 15 chicks, was confined in a pen 4 by 6 ft. A ration composed of ground corn, cornmeal, and corn bran (10:7:3), sprouted oats, charcoal, grit, oyster shell, and a complex salt mixture was fed to one lot (control), while 12 other lots received this basal ration plus a protein supplement. The amounts of the latter were so adjusted that the added crude protein formed a definite percentage of the basal ration. Four lots derived their supplemental protein from meat scrap, 4 from soy bean meal, and 4 from both sources in equal amounts.

The control lot, which was on a protein plane averaging about 9 per cent, made an average individual gain of 47.9 gm. per period (14 days) or 1.44 gm. per gram of protein consumed. The nitrogen content of the excreta was 2.24 per cent. Similar data for the other 12 lots are assembled in the following table:

Growth and nitrogen elimination of chicks fed varying amounts of meat scrap or soy bean meal or both, in addition to a corn ration.

Protein added to basal ration.	Protein in feed (approximate).	Individual gain per fortnight.			Gain per gram of protein fed.			Nitrogen in excreta.[1]				Nitrogen waste above control lot.
		Meat scrap lots.	Soy bean lots.	Mixed protein lots.	Meat scrap lots.	Soy bean lots.	Mixed protein lots.	Meat scrap lots.	Soy bean lots.	Mixed protein lots.	Average all lots.	
P. ct.	*P. ct.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5	13	87.0	89.8	90.9	1.31	1.35	1.37	2.73	2.74	2.91	2.79	24.5
10	16	85.3	101.3	101.2	.89	1.08	1.05	3.56	3.62	3.52	3.57	59.4
15	18	80.6	97.3	99.8	.85	1.03	.88	3.35	4.49	4.00	3.95	76.3
20	20	87.2	90.2	98.0	.76	.83	.83	4.44	4.42	4.92	4.59	105.0
Average	....	84.5	95.3	97.5	.95	1.07	1.03	3.52	3.82	3.84	....	....

[1] Average of determinations at the ages of 4, 8, 16, and 20 weeks.

The amount of feed consumed varied but little from lot to lot. It is concluded that the supplemental protein was most effective when 10 per cent was added to the basal ration, and that the meat scrap alone was inferior to the soy bean meal either alone or mixed. The authors also suggest that chicks are capable of utilizing soy bean protein to a greater extent than mammals.

The uniformity in nitrogen excretion of lots on the same protein plane despite the diverse sources of the protein is noted. "It would appear that there was no economy in nitrogen excretion at the point where the gain was most efficient . . . though such an economy might have been expected." For two of the periods separate nitrogen determinations are reported on two portions of the excreta, the portion dissolved in N/10 hydrochloric acid and the portion not dissolved. The nitrogen in the former is considered to represent ammonia, urea, and amino acid nitrogen, and that in the latter mainly uric acid nitrogen. On this assumption the increase in nitrogen excretion (shown in the table) that is associated with increased protein intake consists almost entirely of uric acid.

Data are also tabulated as to the proportion of ash in the excreta, and some information is given concerning an additional lot of chicks fed like one of the meat scrap lots but with the omission of the extra mineral matter. It is stated that this omission made no appreciable difference in the results.

The breed in poultry, and pure breeding, W. A. Lippincott (*Jour. Heredity, 10* (*1919*), *No. 2, pp. 71–79, figs. 7*).—As an illustration of the point that body-shape and not pedigree is the chief criterion of breed in poultry, the case is reported of a standard-bred White Wyandotte hen. In a breeding test at the Kansas Experiment Station, this hen was found to carry the barring factor (sex-linked), and to be heterozygous for the factor (or pair of closely linked factors) which, as the author has shown (E. S. R., 39, p. 877), makes the Blue Andalusian fowl "blue." Since neither of these factors is common in White Wyandottes, it is suggested that the bird in question acquired them through breed crosses several generations back.

The relation of plumage to ovarian condition in a Barred Plymouth Rock pullet, L. J. Cole and W. A. Lippincott (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 36* (*1919*), *No. 3, pp. 167–182, pls. 2*).—The authors report the case of a Barred Plymouth Rock female that was normally feathered in early life but which during a spring molt in the pullet year developed feathers like those of a male in form and structure.

Diagnosis of ovarian tumor was confirmed by an abdominal incision made when the hen was two years old. At the time of incision the authors implanted in the body cavity a piece of the ovary of a freshly killed actively laying pullet, and also plucked the feathers from the left side of the body. The new feathers grown on the denuded area were of typical female structure, so that the bird was cock-feathered on one side and hen-feathered on the other, but the feathers on both sides were alike as to the relative widths of the white and black bars. "Although the failure of the ovary to function properly gave rise to a condition of internal secretion which led to the assumption of male plumage with respect to shape and structure of feathers, the soma was still heterozygous for the barring factor and consequently the white bars in the 'cock' feathers remained narrow as in the normal female."

The paper is a joint contribution from the Wisconsin and Kansas Experiment Stations.

Preparation of eggs for market, E. W. Benjamin (*Cornell Reading Course for the Farm, No. 133* (*1918*), *pp. 217–247, pls. 7, figs. 22*).—The author discusses in considerable detail the candling, grading, and packing of eggs, and the farm conditions likely to affect the quality of eggs. Colored plates and a colored wall chart illustrate the appearance before the candle and when opened of eggs showing various defects.

Poultry in Mauritius, D. D'Emmerez de Charmoy (*Dept. Agr. Mauritius, Gen. Ser., Bul. 12* (*1918*), [*English Ed.*], *pp. 39, pls. 2*).—Information is assembled on the anatomy, breeding, feeding, housing, diseases, and parasites of the domestic fowl, as a step toward getting the poultry industry established on the Island of Mauritius on a commercial scale.

"Attempts have often been made to introduce good breeds of poultry into Mauritius from other countries, and much money has been expended in this way, but no one has hitherto succeeded in acclimatizing any of the breeds so introduced or in obtaining cross-bred fowls suitable to local conditions.

DAIRY FARMING—DAIRYING.

Researches on the influence of the nucleoproteins of the udder on the milk secretion of the cow, R. GIULIANI (*Clin. Vet.* [*Milan*], *Rass. Poliza Sanit e Ig.*, *41* (*1918*), *No. 18, pp. 453-477*).—The author reports an experiment indicating a slight transitory increase in the milk and fat production of cows following injections into the udder of small quantities of nucleoprotein derived from the udders of lactating cows.

The nucleoprotein was prepared from a potassium hydroxid extract of the udder tissue by precipitation with acetic acid, and an injection consisted of 10 cc. of a saturated solution of the precipitate in a weak aqueous solution of sodium carbonate. The injections were made on 10 successive days shortly before the evening milking.

Compared with their average records for the 10 days before and the 10 days after the experimental period, the 4 cows in the experiment showed a respective average increase of 345, 325, 260, and 240 gm. of evening milk per day. The average increase in fat percentage were 0.335, 0.2, 0.39, and 0.29, respectively. No change was observed in the percentages of protein, lactose, and ash, and the next day's morning milk of each animal was normal as to amount and composition.

Production and distribution of milk, W. ASTOR ET AL. ([*Bd. Agr. and Fisheries London*], *Final Rpt. Com. Prod. and Distrib. Milk, 1919, pp. 77, pls. 12*).—The committee on the production and distribution of milk, having issued three interim reports (E. S. R., 41, p. 184) on the war-time problems of the milk industry in Great Britain, devotes its final report mainly to questions likely to arise in the future, both during the reconstruction period and later. After considering the present state of the milk supply as to production, consumption and hygiene, and pointing out the relation between price and consumption and the necessity of reducing the cost of production, the committee discusses the means that might be taken to increase production, decrease production costs, and improve the sanitary quality of milk. Among the specific recommendations are the development of dairy research and education, formation of milk record societies and the keeping of private records, wider use of milking machines, introduction of the accredited (tuberculosis-free) herd system, a system of grading milk similar to that used in New York and other American cities, more satisfactory methods of pasteurization, delivery of milk to the consumer in bottles, increase of the area of farms under cultivation, the growing of alfalfa, increased importation of Holstein cattle, the keeping of goats by small holders, and government aid to dairy farmers in erecting suitable buildings.

The report proper is followed by a series of appendixes, mainly reports of various subcommittees. Matters discussed include the improvement of dairy stock, the handling of milk, labor problems on dairy farms, dairy education, use of milking machines, and the pasteurization of milk in Scotland. The milk regulations of various European countries and the British Colonies are summarized, and data on the cost of milk production in the United States are cited. A number of maps show the density of the human and cow populations in England and Scotland, the distribution of creameries, cheese factories, and condenseries, and the sources of the milk supply of London.

Calculating the cost of milk production, E. G. Misner (*Cornell Reading Course for the Farm, No. 142 (1919), pp. 199–224, fig. 1*).—The author outlines a rather complete cost accounting system "for farmers who desire to calculate and study the cost of producing milk on their own farms." The record blanks presented were not designed primarily for the use of investigators, although it is suggested that cost records be kept on the cow basis so as to facilitate comparisons between different farms. The cost data collected by the U. S. Food Administration (E. S. R., 40, p. 280) are summarized in a table.

Laws relating to milk and milk products (*Boston: Mass. State Dept. Health, 1919, pp. 26*).—This is a compilation of Massachusetts laws pertaining to the control of milk, milk products, and oleomargarin.

Municipal milk control, E. Kelly (*Milk Dealer, 9 (1919), No. 3, pp. 20, 22, 24*).—In this address, delivered at a meeting of the Association of American Dairy, Food, and Drug Officials, the author advocates standardization of municipal legislation regarding milk control, the vesting of power in the local health authorities to formulate minor regulations, and more rigorous qualifications for milk inspectors. It is held that bacteriological analysis of milk can not attain its full usefulness without farm inspection.

[Milk inspection and milk prices in Chicago] (*Rpt. and Handb. Dept. Health Chicago, 1911–1918, pp. 823–834, 890–919, 924–952, 1023–1047, figs. 13*).—These pages include (1) an account of the methods adopted by the Chicago health authorities in inspecting milk supplies and dairy farms, (2) monthly summaries from 1911 to 1918 of bacterial counts, and determinations of fat and solids-not-fat of the market milk delivered, (3) tabulations showing producers' and consumers' milk prices by months from 1907 to 1918, and (4) a short account of the Federal Milk Commission's investigation of the cost of milk production in the Chicago district (E. S. R., 41, p. 573), together with three briefs presented by the Commissioner of Health in January, 1918, on behalf of the consumers.

The movement for cooperative delivery of milk, D. W. Hyde, jr. (*Natl. Munic. Rev., 8 (1919), No. 2, pp. 195, 196*).—The author cites several cases where the dealers supplying milk to a city have adopted or at least formed plans for adopting the zone system of delivery. It is also noted that dealers have combined to organize cooperative pasteurizing plants at Riverside, Cal., and Utica, N. Y.

Milk bottle losses (*U. S. Dept. Agr., Bur. Anim. Indus., Milk-Plant Letters, 60 (1919), pp. 2; 61 (1919), pp. 2; also in Creamery and Milk Plant Mo., 8 (1919), No. 4, pp. 38, 39; and N. Y. Produce Rev. and Amer. Cream., 47 (1919), No. 24, pp. 946, 948*).—Replies are summarized from milk dealers and health officers in 86 cities (33 States) to a questionnaire sent out by the Dairy Division regarding local milk-bottle problems. Data from 50 of the dealers as to losses of milk bottles are tabulated.

Use of other dealers' bottles was reported in 72 cities and traffic in milk bottles by junk dealers in 27. Milk-bottle exchanges were operated in 33 cities. On the average the dealers purchased 1.2 bottles a month for each bottle of milk filled daily. The replacement of bottles was greater proportionally in the larger establishments, despite the fact that such concerns had relatively smaller breakage in the plant. The difference is attributed to the greater effort made by small dealers to secure the return of bottles from customers.

Systems of pasteurization (*U. S. Dept. Agr., Bur. Anim. Indus., Milk-Plant Letter 62 (1919), pp. 2; also in N. Y. Produce Rev. and Amer. Cream.. 47

(1919), No. 23, p. 888).—The results are tabulated of a survey by the Dairy Division of the pasteurization systems in use in 237 milk plants located in the larger cities of the United States. The vat system was used by 88 plants, the in-bottle system by 16, machines of the tubular type by 44, film or drum pasteurizers by 48, and kettle pasteurizers by 37, while 4 immersed the milk cans in vats of water heated by live steam. The vat and in-bottle systems were favored especially by the smaller plants. In 15 cases the flash method was used.

Remade milk and cream, H. W. Redfield (*N. Y. Produce Rev. and Amer. Cream., 48 (1919), Nos. 3, pp. 114, 116–120; 4, pp. 170, 172–175; also in Creamery and Milk Plant Mo., 8 (1919), Nos. 6, pp. 50, 52, 54, 56, 58; 7, pp. 43, 44, 46, 48, 50*).—The material in this paper has been noted from another source (E. S. R., 40, p. 802).

Yeasts and molds in butter and cream, T. H. Lund (*Rpt. Proc. Dominion Dairy Conf. Ottawa, 1918, pp. 59–63; also in N. Y. Produce Rev. and Amer. Cream., 48 (1919), No. 6, pp. 282, 284, 286*).—Results of studies on the influence of pasteurization of cream on the nonbacterial flora of butter are briefly reported.

Seven commercial samples of creamery butter from raw cream and four from cream imperfectly pasteurized by the flash method (at temperatures of 120 to 130° F.) gave an average mold count of 2,039 per cubic centimeter, and an average yeast count of 1,700. The highest mold count occurred among the samples from heated cream. Ten samples from pasteurized cream gave an average mold count of 15 (with a maximum of 110), and an average yeast count (excluding one abnormally high count) of 1,182.

In tests under experimental conditions, *Oïdium lactis* spores in sour cream were completely destroyed by holding at 130° for 30 minutes or at 135° for 10 minutes. The yeast cells were less readily killed, a temperature of 145° for 30 minutes being found necessary.

The author suggests the use of mold and yeast counts as official tests for determining whether butter has been made from raw or pasteurized cream.

The deterioration of butter through the agency of Oïdium lactis, H. M. Nicholls (*Agr. and Stock Dept. Tasmania, Bul. 86 (1919), pp. 4*).—It is stated that Oïdium is widely prevalent in Tasmania and is the cause of much loss to creameries. Pasteurization by the holding rather than the flash method is advocated as a control measure, for the author found that the mold survives brief exposure to temperatures of 170° F. and higher. He also found that the mold would grow in soft butter (butter with high moisture content or improperly refrigerated), and suggests that the nondevelopment of spores in butter observed by Combs and Eckles (E. S. R., 39, p. 785) was due to the hardness of the medium.

VETERINARY MEDICINE.

Report of practitioners' short course in veterinary medicine (*Off. Pub. Iowa State Col. Agr., 16 (1919), Nos. 38, pp. 53, pls. 13; 39, pp. 95*).—In continuation of the report on the short course in veterinary medicine previously noted (E. S. R., 39, p. 582), lectures are presented in No. 38 on Ascariasis and Oesophagostomiasis, by W. W. Dimock (pp. 6–29) and Therapeutic Measures in the Eradication of Certain Animal Parasites, by H. D. Bergman (pp. 30–53). No. 39 includes lectures on contagious abortion and tuberculosis, as follows: The *Bacillus abortus* and Tests for the Detection of Abortion in Cattle, by C. Murray and L. E. Willey (pp. 22–25); Contagious Abortion: Its Complications and Their Treatment, by H. E. Bemis (pp. 25–28); Abortion from the Practitioner's Standpoint, by C. E. Cotton (pp. 29–43); Correlation of Our Present

Knowledge Regarding Infectious Abortion in Cattle, by V. A. Moore (pp. 44–62); Tuberculin Tests for Tuberculosis, by R. R. Bolton (pp. 63–69); and Tuberculosis: Its Prevalence, Lesions, and Interpretation of Tests, by V. A. Moore (pp. 69–84).

Annual report of the Bengal Veterinary College and of the civil veterinary department for the year 1918–19, A. Smith (*Ann. Rpt. Bengal Vet. Col. and Civ. Vet. Dept., 1918–19, pp.* [*30*]).—The usual annual report (E. S. R., 41, p. 680).

Annual report of the civil veterinary department Bihar and Orissa for the year 1918–19, D. Quinlan (*Ann. Rpt. Civ. Vet. Dept. Bihar and Orissa, 1918–19, pp.* [*VI*]*+8+XVI, pl. 1*).—The usual report (E. S. R., 40, p. 183).

Report on the civil veterinary department (including the Insein Veterinary School), Burma, for the year ended March 31, 1918, G. H. Evans (*Rpt. Civ. Vet. Dept. Burma, 1918, pp.* [*6*]*+13, pl. 1*).—The usual annual report (E. S. R., 38, p. 180).

Annual report of the Imperial Bacteriological Laboratory, Muktesar, A. L. Sheather (*Ann. Rpt. Imp. Bact. Lab., Muktesar,* [*India*], *1919, pp. 19*).—This annual report for the year ended March 31, 1919, includes data on the amount of rinderpest and anthrax serums, hemorrhagic septicemia and strangles serum, and vaccines, black quarter vaccine, mallein, tuberculin, and miscellaneous vaccines manufactured and issued, and on the examination of specimens and inoculation work during the year.

Immunization of cattle against rinderpest was carried out by the serum simultaneous method on a total of 1,509 animals. Of 40 pure-bred imported animals thus treated 6 died, 4 from pneumonia and the other 2 as a result of impaction of the stomach. These experiences are thought to indicate the advisability of allowing imported animals sufficient time for acclimatization before subjecting them to simultaneous inoculaton. Excludng the pure-bred stock treated, the percentage mortality of the animals thus immunized was only 0.47.

Studies on anthelmintics.—VII, A comparison of castor oil and other purgatives in connection with the administration of some anthelmintics, M. C. Hall and M. Wigdor (*Jour. Amer. Vet. Med. Assoc., 56* (*1920*), *No. 4, pp. 394–399*).—This is in continuation of the work previously noted (E. S. R., 42, p. 379).

"Experiments published in this paper and elsewhere show that castor oil is highly satisfactory as a purgative after oil of chenopodium, not only by virtue of its purgative properties but by virtue of a protective action aside from this. It will save the lives of animals receiving lethal doses of oil of chenopodium, when administered with the drug or an hour later, and will save animals given lethal doses of oleoresin of male fern when given with the drug.

"Calomel will also save animals when given with lethal doses of male fern. Liquid petrolatum affords but little protection against lethal doses of chenopodium and diminishes the anthelmintic efficacy. Olive oil retards the passage of chenopodium from the stomach and increases gastric absorption; it does not protect against lethal doses. Some medical men prefer magnesium sulphate to castor oil; our data on this point are inadequate. Magnesium sulphate is not well suited to dog practice."

Cresols and substitutes for cresol soaps.—I, Alkaline cresol solutions and their disinfecting power, E. Hailer (*Arb. Reichsgsndhtsamt., 51* (*1919*), *No. 3, pp. 556–576*).—An investigation is reported of the value of preparations of cresol with sodium hydroxid as substitutes for cresol soaps as disinfectants.

It was found that by mixing certain definite proportions of sodium hydroxid solutions and cresol, cresol lyes could be obtained forming clear solutions on diluting with water. The rapidity with which the clear solution forms and the percentage of cresol in such a solution depend upon the alkali content of the cresol lye, 30 per cent of sodium hydroxid forming the clearest solution.

The high content of free alkali in such a solution is said to disqualify it from being used as a skin or wound disinfectant, but it has been found to be an excellent disinfectant for stools and other infectious waste products. For such purposes the author recommends a preparation of equal parts of a 25 per cent sodium hydroxid solution and pure cresol diluted 1:20 with water. The solution thus prepared contains 2.5 per cent cresol.

Mutual precipitation of toxins and their antitoxins: Application to the standardization of antidiphtheritic and antitetanic serums, M. NICOLLE, E. DEBAINS, and E. CÉSARI (*Compt. Rend. Acad. Sci. [Paris], 169 (1919), No. 26, pp. 1433, 1434*).—The principle that various antitoxic serums form specific precipitates when mixed with the corresponding toxins has been applied to the standardization of antidiptheritic and antitetanic serums as follows:

The filtrates from cultures of the organisms are saturated with anhydrous sodium sulphate, the precipitates obtained are vacuum-dried over sulphuric acid and reduced to a homologous powder, and the powder is dissolved in distilled water in the proportion of 0.8 gm. of the powder to 10 cc. of water. The toxic solution is then mixed with an equal volume of a 10 per cent solution of gelatin in physiological solution and placed in 1 cc. quantities in separate tubes, which are then placed in the refrigerator until the gelatin has solidified.

In testing the antitoxic serums, 1 cc. of the serum at varying dilutions is added to the tubes containing the gelatin-toxin mixture, and the tubes are kept at room temperature for two hours. At the end of this time, the appearance of a white ring at the juncture of the two liquids denotes a postive result. The standard values of antidiphtheritic and antitetanic serums of the Pasteur Institute (Paris) correspond in the above technique to the formation of the ring with 1 cc. of the serum diluted 1:50.

It is stated that this standardization in vitro has proved to be in absolute concordance with the usual standardization in vivo. The advantages which the new method offers are considered to be in simplicity and in economy of time, labor, and expense. It further permits studies of the progress of the antitoxic property at the beginning of the immunization, thus making possible the early elimination of horses unsuited to the production of antitoxins.

Protein fever.—The effect of egg white injection on the dog, S. J. COHEN (*Jour. Lab. and Clin. Med., 5 (1920), No. 5, pp. 285–294, figs. 4*).—"Repeated subcutaneous injections of egg white in guinea pigs produce a constant fever, associated with most of the signs of infection. . . . Repeated subcutaneous injections of egg white in dogs do not affect the temperature curve and do not produce fever. The author is unable to explain the difference of reactions."

Contagious abortion of cattle, C. P. FITCH and W. L. BOYD (*Minn. Agr. Ext. Spec. Bul. 28, rev. (1919), pp. 14, pls. 5*).—This is a summary of information on the nature of contagious abortion, means of prevention, and treatment.

"Owing to the prevalence of abortion and the extensive distribution of the germs, together with the rarity of abortion from other causes, one is usually safe in deciding on the nature of the disease from the history and symptoms of the affected animals. A laboratory examination of the blood of heifers or cows in the light of our present knowledge seems to be of little practical value in the control of this disease. White scours and calf pneumonia are often found to coexist in herds affected with abortion, and are thought to be closely related.

"No drugs have yet been found that will cure or prevent this insidious disease, although much can be accomplished in the way of control and eradication by the proper treatment and by practicing rigid sanitary measures. As the treatment of abortion is mainly through prevention, strict hygienic measures, such as irrigating the vagina of the heifer or cow before breeding and irrigating the sheath of the bull both before and after service, should be practiced in all herds. The use of vaccines in the control of this disease is still in its experimental stage. The treatment of sterile or nonbreeding cows requires surgical knowledge, and should be attempted only by competent and skilled veterinarians. The use of white scours serum is indicated in all cases where scours of pneumonia of calves is present.

"Breeders, when purchasing animals, should inquire carefully concerning the breeding history of the particular individuals to be bought and also of the entire herd in which these animals are located."

Diagnosis of bovine contagious abortion, C. P. Fitch (*Jour Amer. Vet. Med. Assoc., 56 (1920), No. 5, pp. 459–467*).—The conclusions drawn by the author are as follows:

"Abortions due to other than specific biological agents are rare. The history or physical examination of cases of abortion does not in all cases furnish definite grounds for a diagnosis. They are always, however, valuable adjuncts. Abortion or the precipitation tests are of little if any value. The cultural method is an exceedingly valuable aid in determining the cause of the particular case studied. Negative results from cultures can not exclude the presence of some infective agent. The agglutination test is the most reliable of the serological methods of diagnosis. It will indicate the amount of herd infection. It will not pick individual aborters. A positive reaction to this test means past or present infection. Guinea pig inoculation is a valuable method of determining the presence or absence of *B. abortus*. Many inoculated pigs, however, die of sepsis."

The etiology of so-called infectious abortion disease of cattle, E. C. Schroeder (*Jour. Amer. Vet. Med. Assoc., 56 (1920), No. 4, pp. 369–377*).—A paper presented at the twenty-third annual meeting of the U. S. Live Stock Sanitary Association in Chicago, December, 1919.

Relationship of equine and human glanders, C. D. McGilvray (*Jour. Amer. Vet. Med. Assoc., 55 (1919), No. 6, pp. 627–634*).—The author describes the clinical aspects of glanders in man and in horses, the diagnosis of the disease by outward symptoms and by the allergic reactions with mallein, and the means employed in Canada for the suppression of equine glanders.

Statistics are given showing the progress made and the compensating cost of suppressing glanders in Canada from 1905 to 1917. The number of horses examined dropped from 1,777 in 1905 to 40 in 1917, and the reactors found from 40 to none. It is stated that the complete eradication of the disease has already been accomplished in several of the Provinces.

Louping-ill: Duration of the infectivity of the ticks, S. Stockman (*Jour. Compar. Path. and Ther., 32 (1919), No. 4, pp. 283–285*).—Continuing previous work (E. S. R., 40, p. 383), experiments are reported which supply direct evidence that if the tick is the carrier the duration of infectivity is probably as long as the life of the tick in the stage of its life cycle in which it is infective. The experiments show that measures of eradication based upon the starvation of the tick are impractical on account of the long period during which pastures would have to be left idle.

Observations on recurrent ophthalmia at the veterinary bacteriological laboratory, B. E. F., Italy, and at the Central Veterinary Research Labora-

tory, Aldershot, R. H. Knowles (*Jour. Compar. Path. and Ther., 32 (1919), No. 3, pp. 192–196*).—The author first reports on the symptoms of two typical severe cases of recurrent ophthalmia selected from 25 cases of the disease, one of which was thought to be suffering from a primary attack, and the other, from a second or third attack. This is followed by a report upon agglutination tests at the Central Veterinary Laboratory, with the view of determining whether a specific agglutinin for the nerve bacillus was present in the blood of horses either suffering from recurrent ophthalmia in the acute stage or in which the active symptoms of the disease had subsided.

The results show (1) that a nonspecific agglutinin for the nerve bacillus is present in the blood of almost all horses, acting in dilutions of 1 in 10, and sometimes in 1 in 20, but not in higher dilutions; and (2) that the sera of horses either in the acute stage or the quiescent stage of recurrent ophthalmia do not contain agglutinin for the nerve bacillus in excess of the amount present in sera from normal horses; or, in other words, no specific agglutinin for the nerve bacillus is produced in cases of recurrent ophthalmia.

The author concludes that "if the presence of a microorganism in the eye is the cause of recurrent ophthalmia, special technique or culture media will be necessary for its isolation. It is doubtful if the so-called nerve bacillus plays any rôle in the etiology of recurrent ophthalmia."

Rinderpest in the New Langenberg Province of German East Africa during 1917–18, H. H. Curson (*Jour. Compar. Path. and Ther., 32 (1919), No. 3, pp. 197–210*).—A report of observations on the nature, occurrence, etc., of this disease.

Experimental transmission of swamp fever or infectious anemia by means of insects, J. W. Scott (*Jour. Amer. Vet. Med. Assoc., 56 (1920), No. 5, pp. 448–454*).—This paper, read before the fifty-sixth annual meeting of the American Veterinary Medical Association at New Orleans in November, 1919, is based upon investigations, a report of which in part has been previously noted from another source (E. S. R., 41, p. 478). The author considers his experiments to furnish conclusive evidence that certain bloodsucking flies, particularly the stable fly and *Tabanus septentrionalis*, may transmit infectious anemia of the horse.

Notes on swamp fever, S. Hadwen (*Jour. Amer. Vet. Med. Assoc., 56 (1920), No. 5, pp. 439–443*).—This paper relates to the occurrence of intestinal worms, particularly *Triodontophorus tenuicollis*, in cases of swamp fever. Thus far, however, the author has found no evidence of a definite relation between parasitic worms and swamp fever.

Trematodes produced in South African snails: Encysting cercariæ, F. G. Cawston (*Jour. Compar. Path. and Ther., 32 (1919), No. 3, pp. 210–212*).—Of the various cercariæ that infest fresh-water snails of Natal and the Transvaal, the author has observed two encysting forms.

The use of carbon bisulphid in infestations with bots, Gastrophilus spp., M. C. Hall and L. Avery (*Jour. Compar. Path. and Ther., 32 (1919), No. 4, pp. 286–290*).—Previously noted from another source (E S. R., 42, p. 381).

Control of the cattle tick, T. H. Johnston (*Sci. and Indus.* [*Aust.*], *1 (1919), No. 7, pp. 419–425, figs. 2*).—The author reports upon life history investigations of *Margaropus annulatus*. The data presented by months in tabular form show the minimum periods elapsing between the dropping or removal of the engorged female, and the earliest hatching of the eggs, and the maximum period between the dropping or removal of the engorged female and the death of all the larvæ which hatch from its eggs, no food being supplied. The data are based upon observations by trained observers stationed at Brisbane, Wooloogа, Toowoomba, and West Burleigh.

A malarial parasite in the blood of a buffalo, A. L. SHEATHER (*Jour. Compar. Path. and Ther.*, *32* (*1919*), *No. 4*, *pp. 223–229*, *pls. 2*).—Previously noted from another source (E. S. R., 42, p. 381).

Potassium iodid in malnutrition of pigs, J. J. FREY (*Jour. Amer. Vet. Med. Assoc.*, *56* (*1920*), *No. 5*, *p. 508*).—Reference is here made to an affection among suckling pigs in the foothill district of the Sacramento Valley, in which scalded-like areas appeared around the mouth and on the face and ears when the pigs were about three days old. While retaining a good appetite they become emaciated, the skin developed a scurvy-like surface, was wrinkled all over the body, and was hard to the touch. These symptoms progressed with increasing weakness until the pigs finally lay on their sides, unable to rise, and died in the course of two days or more.

The addition of about 2 gm. of potassum iodid dissolved in water and mixed with mash fed to the sows and litters daily resulted in almost immediate improvement. This corroborates the results obtained by Hart and Steenbock, and by Welch (E. S. R., 39, p. 187).

Progress in hog cholera control, U. G. HOUCK (*Jour. Amer. Vet. Med. Assoc.*, *56* (*1920*), *No. 4*, *pp. 359–368*).—A paper presented at the twenty-third annual meeting of the U. S. Live Stock Sanitary Association in Chicago on December 1, 1919.

Study of the swine erysipelas bacillus, L. COTONI (*Ann. Inst. Pasteur*, *33* (*1919*), *No. 9*, *pp. 634–644*, *pl. 1*; *abs. in Rev. Bact.*, *9* (*1919*), *No. 4*, *p. 89*).—The author records the results of a comparative study of the morphology, cultural characteristics, and pathogenicity of 11 strains of *Bacillus erysipelatis suis*.

Joint-ill in foals: Etiology, H. MAGNUSSON (*Jour. Compar. Path. and Ther.*, *32* (*1919*), *No. 3*, *pp. 143–182*, *figs. 9*).—The author reports upon investigations conducted during the years 1915–1918 at the Bacteriological Laboratory of the Agricultural Society, Malmö, Sweden. The results of the trials with serum and vaccine treatment of joint-ill are summarized as follows:

"The prospect of successfully treating foals already infected, and showing such highly developed lesions as severe arthritis with outward fistulas, numerous intramuscular abscesses, etc., is practically nil. Foals which fall ill immediately after birth should be treated with mixed streptococci and coli serum, or coli serum alone, 50 to 100 gm. Foals older than 8 days should be given large doses (100 to 200) of streptococcus serum alone. The injections should be made intravenously.

"Preventive inoculation with a mixture of coli serum and streptococcic serum and simultaneous vaccination with streptococcic vaccines gives good results, and should be used in stables where joint-ill generally appears. Further, in cases of navel abscess, or where the navel wound has been much dirtied at birth and the navel stump shows an inflamed appearance, vaccination ought not to be neglected as, especially in streptococcic infection, the disease shows itself so late that an eventual injection with serum made immediately after birth has had time to be eliminated. Passive immunity, as is well known, seldom lasts more than three or four weeks after the injection.

"The fact, however, that the *Bacterium viscosum equi* and some other bacteria occur in foals suffering from joint-ill will reduce the chances of always getting positive results by serum treatment. One has, therefore, to reckon with a certain death rate among the foals treated with colon and streptococcus sera. We must, however, do something against such a redoubtable disease, and it is indicated to make use of what our etiological researches have disclosed and try the specific action of serum and vaccine against infection with colon bacilli and streptococci."

The findings in 73 cases of joint-ill, septicemic or pyemic, in foals caused by *B. viscosum equi* are given in an appended table, as is a 3-page bibliography.

Joint-ill in foals: Etiology and serum treatment, J. M. McFadyean and J. T. Edwards (*Jour. Compar. Path. and Ther., 32 (1919), No. 4, pp. 229–283, fig. 1*).—This is a report upon bacteriological examinations of the diseased joints and other parts from 35 foals that died from joint-ill in 1919, in continuation of investigations of 1918 in which 37 foals were reported upon (E. S. R., 41, p. 480).

"In 22 of the cases the liquid in the diseased joints or pus from abscesses contained abundant streptococci, occurring in a state of purity in 13 cases, and containing only a small proportion of other organisms, presumably accidental contaminations, in the remaining 9 cases. In six cases coliform bacilli were present, either in a state of purity, or so greatly outnumbering other organisms present as to indicate that they were responsible for the lesions. In one of these the other organism included a small number of streptococci. The *Bacillus nephritidis* Meyer (or *Bacterium viscosum equi* Magnusson) was found in one case, accompanied by a few impurities. In four cases organisms which could not with certainty be identified with any named species were present in a state of purity in the joints. The most interesting of these was a streptothrix, which was abundantly present unmixed with any other organisms, in the diseased joint. . . . In two cases it was found impossible to come to any conclusion regarding the nature of the infection, but in neither of these were streptococci detected.

"The number of cases examined in the two years was 72, and in 45 of these, or 62.5 per cent, streptococci appeared to be the cause of the disease, leaving 27 or 37.5 per cent caused by other organisms. This gives a much larger proportion of streptococcus infections than Magnusson [see above abstract] found in 236 cases in Sweden (36.9 per cent), but that author considered that in his series the proportion of streptococcus cases was depressed owing to the fact that fewer of the older foals were sent to him for examination, and, perhaps, also by a lowering of the mortality in cases of that kind by the antistreptococcus serum and vaccines with which the foals had been treated. It is probable that in our series the percentage of cases caused by the *B. nephritidis equi* is too low, owing to the fact that in almost all our cases the joints or other parts were forwarded because the foals had died after treatment with serum. As a rule, the foals infected with that organism die sooner than those infected with streptococci, and a smaller proportion of them would, therefore, survive until a veterinary surgeon was called in and applied serum treatment.

"Having regard to the facts, it would appear that the actual proportion of cases of joint-ill caused by streptococci is somewhere between Magnusson's figures and our own, or probably about 50 per cent."

During 1919 a specific antistreptococcus serum, using for the purpose strains of streptococci isolated from the diseased joints of foals put up in doses of 25 cc., was supplied gratis and detailed reports were received of 253 cases thus treated. In 130 of the cases the disease terminated fatally or the foal was destroyed on humane grounds when recovery appeared to be impossible. In the remaining 123 cases the foals were reported some months after treatment to have recovered, but in 7 of them the recovery was then not complete. A brief report on each of the 253 cases treated with antistreptococci serum is appended.

Of 172 cases treated with *B. abortivo equinus* in 1917, 104 died, while in 1918, 250 foals were treated with this serum and 127 died.

Diseases of domesticated birds, A. R. Ward and B. A. Gallagher (*New York: Macmillan Co., 1920, pp. XII+333, figs. 69*).—Following an introduction by V. A. Moore, the successive chapters with references to the literature included take up the diseases and parasites of domestic fowl (pp. 28–225), diseases of the ostrich and canary birds (pp. 226–241, 252–260), caponizing, (pp. 302–313), killing poultry (pp. 314–322), etc. Author and subject indexes are appended.

RURAL ENGINEERING.

The elements of hydrology, A. F. MEYER (*New York: John Wiley & Sons, Inc., 1917, pp. XII+487, pls. 7, figs. 283*).—It is the purpose of this book to set forth fundamental data and considerations underlying the science of hydrology, and it is intended for the use of professional men, teachers, and students of engineering. It contains the following chapters: The atmosphere—its temperature, pressure, and circulation; water—its various states and their properties; precipitation—its occurrence and distribution; evaporation from water surfaces; evaporation from land areas; transpiration; deep seepage; run-off; stream-flow data; supplementing stream-flow data; modification of stream flow by storage; and note to teachers of hydrology.

National Forests and the water supply, S. T. DANA (*Amer. Forestry, 25 (1919), No. 312, pp. 1507–1522, figs. 32*).—A popular and well illustrated discussion is given of the relation of the National Forests to water supplies for irrigation, power development, and domestic use.

An improved weir for gauging in open channels, C. HERSCHEL (*Mech. Engin. [New York], 42 (1920), No. 2, Sect. 1, pp. 83–88*).—The results of a series of investigations on weirs, conducted at the Massachusetts Institute of Technology, are reported, during which the author devised an entirely new weir.

The tests revealed that for discharges of from 0 to 9.55 cu. ft. per second per foot of weir length, the limits covered by the experiment, the quantity of water flowing, Q, was directly proportional to the difference, *d*, in two pressures, one measured just upstream of the weir and corrected automatically for the velocity of approach, and the other measured at the crest. The formula for this weir is $Q=5.5\ d$.

The weir, which bears no resemblance to the sharp-edged weir now in use, has a 2:1 slope of approach to the crest. The crest is made in the form of an arc of a circle, and is hollow for observing the pressure at that point. The nappe of the stream is supported for a short distance beyond the crest by another 2:1 slope. Descriptions and diagrams of the apparatus and tests, together with tabular and graphic reports of the data obtained, are included.

The discharge of smooth wood-stave pipes and wood channels, A. A. BARNES (*Engin. News-Rec., 84 (1920), No. 5, pp. 228–230*).—This is a comparison of observed and calculated velocities in large and small pipes and open conduits of different shapes, particular reference being made to the work of Scobey (E. S. R., 36, p. 281). The author regards the results obtained by Scobey with some suspicion, in view of discrepancies of about 17 per cent in individual tests. A warning is given regarding the difference in the conditions of flow in an unplaned wood pipe and a smooth-planed wood pipe, which is considered to be of much importance in determining discharge.

Great new irrigation and power developments, C. H. LEE (*Jour. Electricity, 44 (1920), No. 3, pp. 119, 120, fig. 1*).—Statistical data, compiled by the State Water Commission of California, are briefly reported on the resumption of activity in agricultural and hydroelectric power development during the past year. These indicate not only a return of normal activities but an increase of nearly 40 per cent over the average for the past five years, and show that in the past six months applications have been filed contemplating active development of 26 per cent of the maximum ultimate hydroelectric power resources of the State.

Water cost of irrigation, Truckee Valley, Nev., C. A. NORCROSS (*Nev. Agr. Col. Ext. Bul. 25* (*1919*), *pp. 31*).—This bulletin presents a study of the irrigation situation in the Truckee Valley, Nev., on a crop producing area of 83,500 acres in relation to the quantity of water applied, evaporation and transpiration loss, seepage return to the Truckee River Channel, irrigation methods practiced, and the duty of water for the general area.

From a consideration of a large number of evaporation, transpiration, and duty of water measurements, it is deduced that the minimum seasonal depth of water necessary to be applied to the area to cover evapo-transpiration and seepage is 33.39 vertical in., 77.6 per cent of which would be evapo-transpiration loss and 22.4 per cent return seepage. This would be the condition were the sloughs and water surfaces eliminated. Under existing conditions, however, the evaporation loss is subtracted from the surplus or economic head applied in irrigation while such waters are retarded in the slough and water-surface areas in transit to the river outlet. Charging such evaporation to the irrigated area, the evaporation and evapo-transpiration loss plus seepage would require a minimum application, without additional correction for economic head, of 35.1 vertical in., 77 per cent of which would represent evaporation and evapo-transpiration, and 23 per cent return seepage.

An economic head equivalent to 6.385 vertical in. of applied water in irrigation may be supplied with a net increase of 8,665 acre-ft. to the 98,006 acre-ft. minimum, representing a total diversion from the river and creeks of 106,671 acre-ft. Such 8,665 acre-ft. for the season is represented by a constant retardation of 619 acre-ft. of water during the irrigation season, returning to the river at the close thereof. Inclusive of such economic head, the average duty of water in the Truckee Valley is 38.2 vertical in. Of such applied quantity, 25.85 vertical in., or 67.6 per cent, is lost by evapo-transpiration from the irrigated area; 1.72 vertical in., or 4.5 per cent, is lost by evaporation from slough and water surfaces; 7.49 vertical in., or 19.6 per cent, returns to the river as retarded seepage; and 3.14 vertical in., or 8.2 per cent, is returned as waste water. The actual loss from evaporation and transpiration is 27.57 vertical in., the remaining 10.63 in. returning as retarded seepage and waste water to the river channel.

Relief from floods, J. W. ALVORD and C. B. BURDICK (*New York: McGraw-Hill Book Co., Inc., 1918, pp. VIII+175, pls. 2, figs. 52*).—This is a semitechnical book, the purpose of which is to outline briefly the general flood problem in all its many phases, to show what remedies can be applied, and to point out the way to the selection of the proper works. The following chapters are included: The flood problem, various means for relief, flood investigations, fundamental data, future floods, flood protection by channel improvement, and flood prevention by water storage.

The progress of the purification of water with chlorin, A. MOREAU (*Bul. Soc. Encour. Indus. Nat.* [*Paris*], *131* (*1919*), *No. 6, pp. 416–423, figs. 4*).—This is a review of recent developments in the methods and apparatus for the purification of water by means of chlorin.

The conclusion is drawn that treatment of water with chlorin is now a practical process, which causes a marked reduction in the number of organisms and totally destroys the coli bacilli, particularly when the water has been previously filtered for the removal of suspended matter. One of the difficulties remaining is the fact that traces of the chlorin sometimes remain in the treated water. The use of sodium bisulphite or sodium hyposulphite has been found to successfully remove such traces of chlorin, the latter being preferred on account of its availability and low price.

The American highway problem, A. R. HIRST (*Good Roads, n. ser., 19 (1920), No. 1, pp. 1–5*).—This article deals in a rather general way with problems relating to the securing of materials, construction, labor, efficient construction organizations, and fair prices, and improved location and alignment. Particular reference is made to the work of the Bureau of Public Roads of the U. S. Department of Agriculture, and to the fixing of salaries for highway engineers, it being argued that salaries should be paid highway engineers commensurate with the type and expense of the work of which they have charge.

State highway construction in 1919 and 1920 (*Engin. and Contract., 53 (1920), No. 5, pp. 119–124*).—Data are summarized from the different States as to the nature and cost of highway construction during 1919 and the probable nature, extent, and cost of construction during 1920.

Third biennial report of the Oregon State Highway Commission, S. BENSON ET AL. (*Bien. Rpt. Oreg. State Highway Comm., 3 (1916–18), pp. 154, pls. 2, figs. 30*).—This report deals with the activities and expenditures of the Oregon State Highway Commission for the biennium ended November 30, 1918, and includes the State highway engineer's report, tabulated statements of expenditures and costs, general tabulated information and maps, and a general description of work in various counties.

It is noted that up to November 30, 1918, 15 post road projects had been submitted to the Bureau of Public Roads of the U. S. Department of Agriculture for approval. An agreement has been reached upon cooperation on 14 forest road projects. It is also noted that during the 2-year period the actual construction work undertaken and completed consisted of 50 miles of paving, 111.8 miles of macadamizing, 134.5 miles of grading, and 40 bridges and large culverts. In addition, surveys of 902 miles of State roads have been made and designs for 42 bridges prepared for county authorities. The total amount expended on road work during the period was $3,597,982.47.

Constitution and statutes of the State of Oregon relating to roads, highways, bridges, and ferries, compiled by B. W. OLCOTT (*Salem, Oreg.: State, 1917, pp. 216*).—This is a compilation of the road laws of the State of Oregon, containing all of the general laws of the State relating to roads, highways, bridges, and ferries, which are to be found in Lord's Oregon Laws in so far as the same have not been repealed, and also all acts relating to roads, highways, bridges, and ferries which were enacted by the Legislative Assembly of the State at its twenty-sixth, twenty-seventh, twenty-eighth, and twenty-ninth biennial sessions.

Developments in New York State highway maintenance (*Engin. News-Rec., 84 (1920), No. 6, pp. 265, 266, figs. 5*).—It is stated that maintenance equipment to be employed by the New York State Highway Department will include equipment storehouses of permanent construction, converted army motor trucks, and two-wheeled coal carts for cold patching.

Two-wheeled material carriers for maintaining bituminous macadam surfaces have been found to be specially useful. The cart is used with the small concrete mixer for hauling cold patch bituminous mixtures for repairing small holes. The advantages of the device are that it is low, so that the mixer can dump directly into it, and that it is easily propelled by two men. Cold patching has been found to be very successful and is quite extensively used. Cold patch material is also being used in the State for extensive resurfacing and widening.

It is stated that conspicuous success has been attained in converting fixed-body army motor trucks into vehicles adapted to special maintenance operations.

Variable designs for county highway systems (*Engin. News-Rec., 84 (1920), No. 5, pp. 243, 244*).—Experience with macadam roads in Monroe County, N. Y., is summarized. The county has an area of 62 square miles and approximately 1,360 miles of rural highways.

The conclusion from this experience is drawn that the original construction of crossroads in the State-county system should be of water-bound macadam, utilizing local materials to their fullest extent, maintained by surface oiling. The original construction of secondary radial roads in the State-county system should be of penetration bituminous macadam, utilizing local materials, maintained by surface oiling. The construction of main trunk line, State route, heavy hauling roads should be of rigid pavements, using the best materials that can be obtained, but varying the type to secure in each case the cheapest first-cost pavement. For these roads no choice is made between concrete, brick, sheet asphalt, asphalt block, or stone block on concrete bases.

The gradual resurfacing of the heavier traffic macadam roads with topeka mix or small brick cubes is advocated. This method was successfully utilized in the county in reducing high-surface maintenance cost where the macadam foundation was solid enough for the traffic. It is believed that the county has been better served in the past and will be best served in the future by variable road designs, using for the majority of the mileage modern macadam for the original construction, later modified, if necessary, by recapping with a lower maintenance-cost surface.

Inclined planes instead of curve suggested for highway surfaces (*Engin. News-Rec., 84 (1920), No. 5, p. 227, fig. 1*).—A study of field conditions has shown that on nearly every road whose cross section is that of a parabolic curve the central portion is too flat, and during the rainy season water often stands along the center portion. In addition, the parabolic camber gives a constantly increasing steepness to the outer edge of the pavement. It is suggested that two plane surfaces meeting at the center would take care of drainage more effectively, since the central portion would be as well drained as that closer to the edges. The cross section could be made of two plane surfaces sloping away from the center line at the rate of ½ in. per foot, the peak being rounded by a curve tangent a foot or two on either side of the center.

Under this plan it is noted also that when a vehicle keeps to one side of the road broad tires would be given a bearing for their full width, which is not the case with the curved surface. It was found that when 12 to 15 ton loads were hauled on a truck with 18-in. iron wheels the wheels cut into the surface of a curved concrete paving and damaged it seriously, because only the inner edges of each tire secured a bearing on the curved surface of the road.

Instructions and table for reducing labor in curve computation, J. A. Lilly (*Engin. and Contract., 53 (1920), No. 5, pp. 137, 138, fig. 1*).—A brief mathematical analysis of vertical curves for highway purposes, from which a table for use in selecting curves is given.

Fast road-building with concrete hauled four miles (*Engin. News-Rec., 84 (1920), No. 6, pp. 280, 281, figs. 5*).—Experience is related on the concreting of a 6-mile road under the supervision of the Illinois Division of Highways, the concrete being hauled from a central mixing plant, a distance of 2 miles.

It is stated that wet-batch haulage on this work has demonstrated the practicability of making a round trip of 4 miles in 30 minutes. While hauling causes no segregation of the ingredients in concrete of the stiff consistency specified, a tendency of the coarse aggregate to settle is noticeable in any batch that chances to be too wet. A thorough remixing, however, is effected by the process of dumping, spreading, and tamping. It is stated that a speed of construction is being obtained with this long-distance wet haulage which compares well with the average shown by more common methods of placing concrete directly from the mixer, and the concrete is passing with no difficulty the most rigid inspection.

Charts tell cost of concrete paving, F. J. Herlihy (*Engin. News-Rec., 84 (1920), No. 6, pp. 261–264, figs. 5*).—Graphic data are given from which bidding prices on concrete paving contracts may be determined, covering a wide range of physical conditions and variations in wages of labor and prices of equipment.

Reinforced concrete construction.—I, Fundamental principles, G. A. Hool (*New York: McGraw-Hill Book Co., Inc., 1917, 2. ed., rev., pp. X+254, figs. 111*).—This is the second revised edition of this book (E. S. R., 31, p. 186), in which all references to the recommendations contained in the First Progress Report of the Joint Committee on Concrete and Reinforced Concrete have been so changed as to apply to the final recommendations of this committee. Changes have also been made in the illustrative problems which are based on these recommendations. The principal changes occur in the articles on the design of web reinforcement in beams and in the treatment of columns.

Permeability of concrete, S. Bowman (*Jour. Soc. Chem. Indus., 38 (1919), No. 17, pp. 325R–327R, fig. 1*).—This article describes in outline a method of investigating (1) the comparative merits of various concrete waterproofing agents, (2) the effect of such compounds on the chemical and physical properties of Portland cement and reinforced concrete, and (3) the economic aspect of the use of such compounds. The following tests are recommended: (1) Porosity, (2) tensile strength, (3) compressive strength, (4) setting time and soundness, (5) chemical composition, (6) corrosion of reinforcement, and (7) adhesion of reinforcement.

Recent experiments with straw gas, A. R. Greig (*Jour. Engin. Inst. Canada, 3 (1920), No. 1, pp. 10–12, figs. 4*).—This report describes experiments and apparatus used in the distillation of gas straw as done by the agricultural engineering department of the Saskatchewan University.

An average of 500 cu. ft. of gas was obtained from 100 lbs. of wheat straw. This gas has a heat value of nearly 400 B. T. U. per cubic foot. In trials with a 4-h. p. gas engine it was found that straw gas is considerably different to deal with from ordinary gasoline. A compression ratio of 5.3 was established. The indicator cards showed an explosive pressure of 260 to 290 lbs. Five b.h.p. were obtained at 500 r. p. m. with a fuel consumption of 37.5 cu. ft. per horsepower hour. Five hundred cu. ft. ran a 5-h. p. engine for 2 hours and 40 minutes. Trials with an automobile fitted with a 300-cu.-ft. bag of straw gas showed that the car could be run only a short distance without stalling. The 300 cu. ft. of gas had less heat value than 1 gal. of gasoline, and it is considered that it does not give promise of becoming a substitute for gasoline. It was further found that 450 lbs. of straw will give an amount of heat about equal to one good shovelful of coal.

Data on house heating with straw gas are also given.

A practical brake horsepower formula for internal combustion engines, H. Lemp (*Gen. Elect. Rev., 22 (1919), No. 10, pp. 808, 809, fig. 1; also in Mech. Engin.* [*New York*], *41 (1919), No. 12, Sect. 1, pp. 959, 960, fig. 1*).—The author derives a simple and practical formula for the brake horsepower of internal combustion engines, in which all of the numerical coefficients have been combined into the single round number, 1,000,000. The formula is as follows:

For a single-acting multi-cylinder engine of the 4-stroke cycle type:

$$\frac{s \times d^2 \times n \times N \times MP}{1,000,000} = BHP$$

For a single-acting multi-cylinder engine of the 2-stroke cycle type:

$$\frac{s \times d^2 \times 2 \times n \times N \times MP}{1,000,000} = BHP$$

In these formulas s stands for stroke of piston in inches, d for diameter of piston in inches, n for number of revolutions per minute, N for number of pistons (not cylinders), and MP for mean effective pressure (MEP) in pounds per square inch of piston area multiplied by mechanical efficiency.

A specially useful form of the formula is the one which shows that the ratio of brake horsepower to the product of the mean effective pressure and mechanical efficiency is constant.

Things to consider in radiator fan design, G. W. Hoyt (*Agrimotor, 3 (1920), No. 3, pp. 45–48, figs. 5*).—The author summarizes the important factors in the design of radiator fans for tractors, basing his statements on experimental results, which are graphically reported. The close relation between the water jacket, pump, radiator, and fan are pointed out.

Multiple horse hitches, W. Dinsmore (*Bien. Rpt. Kans. Bd. Agr., 21 (1917–1918), pp. 141–154, figs. 14*).—Considerable information on the design of multiple horse hitches, based in part on work conducted at the Illinois Experiment Station, is given. Hitches designed as a result of this work are briefly described and illustrated. It is noted that in designing any hitch, due consideration must be given to the following points: (1) Number of horses required for good work, (2) equalizing the pull between the horses, (3) method of driving the horses, (4) securing favorable conditions for the horses to work under, and (5) elimination of side-draft.

The influence of speed on the draft of a plow, J. B. Davidson (*Agrimotor, 3 (1920), No. 3, pp. 13–16, figs. 5*).—Tests conducted at the Iowa State College and at the University of California on the influence of speed on the draft of a plow, in which an effort was made to keep all conditions except speed constant, are reported.

It was found that an increase in the field speed from 2 to 3 miles per hour, with a general-purpose moldboard, resulted in an increase of the draft of from 8 to 12 per cent, varying with the soil, and with an increase in the amount of work of 50 per cent. Doubling the speed resulted in an increase of draft of from 16 to 25 per cent, with an increase in the amount of work of 100 per cent. The furrows were laid more smoothly and the furrow slices better pulverized at the higher speeds. It is concluded that there are no inherent difficulties in plowing stubble ground in good condition at a speed of 4 miles per hour, and that plows can be operated at even higher speeds if specially designed for such speeds.

Harvesting machines, G. Coupan (*Machines de Récolte. Paris: J. B. Baillière & Sons, 1919, 2. ed., rev. and enl., pp. 510, figs. 359*).—This book describes the mechanical details of harvesting machines in general. It is divided into three parts. Part 1 deals with machines for the harvesting of forage and cereal crops; part 2, with machines for the harvesting of root crops; and part 3, with machines for the preparing of crops for use after harvesting, including thrashers, hullers, shellers, grinders, etc.

Economic farm buildings, C. P. LAWRENCE (*London: The Library Press, Ltd., 1919, pp. XXII+180, pls. 4, figs. 82*).—This book deals with both the design and construction of farm buildings, the former subject being treated as clearly and concisely as possible and the latter in detail, with special tabulated information for ready reference. The economic aspect in its various phases has been especially considered, as being one of the essentials of good and careful farm management. The following chapters are included: Economic principles; local conditions, customs, and variations; development of homesteads; additions and alterations; hill farm homesteads; cattle sheds; stables; piggeries; boiler house; slaughterhouse; poultry houses; food stores, barns, etc.; shedding, etc.; lighting; ventilation; water supplies; drainage; walls; paved floors, etc.; slating, etc.; carpentry; joinery; plastering and cement work; ironwork; plumbing; glazing; painting; light structures; repairs; dwelling houses; and mechanical power. It is to be noted that this book has been prepared primarily from the British viewpoint.

Poultry houses for Oklahoma, M. R. BENTLEY and C. M. SMITH (*Okla. Agr. Col. Ext. Circ. 112 (1919), pp.* [7], *figs. 19*).—This is a popular bulletin giving working plans and brief specifications for poultry and brooder houses considered to be best adapted for Oklahoma conditions.

Hatching eggs electrically, P J. DENNINGER (*Jour. Electricity, 44 (1920), No. 2, pp. 73, 74, figs. 2*).—A brief description of apparatus used for the electrical hatching of eggs is given.

RURAL ECONOMICS.

Social and economic fundamentals of agriculture (In *Arbeitsziele der Deutschen Landwirtschaft nach dem Kriege, edited by F. E. von Braun and H. Dade. Berlin: Paul Parey, 1918, pp. 23–192, 973–986*).—Contributions are published here under the editorship of F. E. von Braun and H. Dade on the subjects of the Evolution of Relationships between City and Country, and of Population Policy and Military Preparation, both by C. Ballod; Property Inheritance, Transfer and Purchase, and Colonization, by H. Dade; The Agricultural Labor Situation, by A. Hoffmeister; The Importance of Agricultural Statistics, by F. Zahn; The Food Supply of the German People, I by M. Rubner, II by Backhaus; Cooperation in Agriculture Before and During the War and Its Future, by Johannssen, previously noted (E. S. R., 42, p. 392); Acquiring and Administering of Cooperative Working Credit, by O. Rabe; and The Socializing Influences of Cooperation upon Rural Districts, by Rang.

Agriculture of tomorrow, FERNAND-LAURENT (*L'Agriculture de Demain. Paris: Libr. Dalloz, 1919, pp. 113+*[*1*]).—The author outlines the differences between the views of the French Chamber of Deputies and Senate on the question of whether compensation from the State for war losses in agricultural industries should be administered from the point of view of the social and economic interests of the State by paying the loss at its value on the eve of demobilization plus expenses of reconstruction, on condition that the beneficiary rebuild his agricultural enterprise; or from that of the individual by paying damages on either of two conditions, one that the recipient invest in agriculture, in which case he should be reimbursed for expenses incurred, the other that he should receive the amount of the loss suffered in 1914 and remain free to reinvest at will.

Other needed legislation to encourage or compel the assembling of parceled holdings and the return of farming land to cultivation, to guarantee to tenants the increase in value for which they may be responsible, to reform laws of inheritance, holding, and transfer, and to aid the development of agricultural cooperation is made the subject of critical study.

Possibilities of increased production in our rural industries, A. J. Perkins (*Jour. Dept. Agr. So. Aust., 23 (1919), No. 5, pp. 396–425*).—The pre-war agricultural and pastoral revenue of the State is reviewed, and such means of increasing rural production as increasing the mean returns of existing industries and the adoption of new forms of rural enterprise are discussed, emphasizing the importance of the question of markets.

Government experimental scheme of land settlement under a colony system (*London: Bd. Agr. and Fisheries [1919], pp. 4, figs. 2*).—This pamphlet describes the small holding and profit-sharing colony systems proposed by the British Board of Agriculture and Fisheries and being tried out on three estates in England and one in Wales.

Land for settlers (*So. African Jour. Indus., 2 (1919), No. 11, pp. 1061–1069*).—Notes are given on the Crown lands available in the Transvaal and Cape Province for stock farms and small holdings for irrigation and dry farming. Methods of tenure and purchase and the financial assistance and training offered are also noted.

Land values in France, P. Caziot (*Vie Agr. et Rurale, 9 (1919), Nos. 47, pp. 337–375; 51, pp. 453–457; 52, pp. 472–475*).—The author attempts to show that the apparent rise in land values has not kept pace with the changes in the purchasing power of money and that landed proprietors are bearing the burden. The facts that land sells more readily than before the war and that operators are buyers and are displacing large proprietors are pointed out. Details of the situation in various regions of France are given.

War prices and the French farmer income, J. J. Newlin (*Wallaces' Farmer, 45 (1920), No. 7, pp. 534. 536, fig. 1*).—The author's observations of agricultural prices in France are recorded here. He notes an average 15 per cent increase in price of land, accompanied by a 200 to 600 per cent advance in prices of farm products, particularly of live stock and oats, and a conservative attitude of the prospective French farm land buyer.

Investigations relative to agricultural profits, 1917–18 (*Ann. Agr. Suisse, 20 (1919), No. 2, pp. [III]+66–249*).—This continues statistical reports previously noted (E. S. R., 38, p. 596).

The dairy farming business in western Ontario, A. Leitch and J. C. Neale (*Ontario Dept. Agr. Bul. 275 (1920), pp. 24*).—This bulletin sets forth the conclusions from a farm survey of the dairy farm business conditions in western Ontario during the 12-month period ended February 28, 1919, following an investigation previously noted (E. S. R., 42, p. 290).

It is indicated that it is possible by employing better farming methods to raise the labor income from the small farms considerably above the average, and that for dairying purposes farms of from 61 to 75 tillable acres and 111 to 135 tillable acres are odd-sized farms requiring greater managerial ability than do farms of any other size. The labor income advances steadily with increased crop yields per acre if all other factors remain constant.

The quality of live stock is the greatest single factor in determining profit or loss in the dairy farming business, and the use of a grade or scrub sire can not be tolerated. All-year dairying has proved a most profitable feature of farm organization in this locality. It is concluded that the average man should not specialize in dairying to a greater degree than the receiving of 70 per cent of his gross revenue from the dairy herd, and that the majority of farmers in Oxford County may add to their profits by maintaining larger herds of milch cows on their present acreages. A liberal expenditure for labor and feed is advocated.

Despite the increased prices of farm products during the past few years 6 per cent of these farmers had labor incomes of less than nothing in the period covered. The average cost of production of milk on 139 Oxford County farms was $2.64 per hundredweight, and the average selling price was $2.36 per hundredweight. Breeding is a slower but much more profitable method of increasing milk yield per cow than is feeding, and there is danger of feeding beyond the producing capacity of cows.

Share leases for dairy farms, J. D. BLACK (*Hoard's Dairyman, 59* (*1920*), *No. 3, pp. 108, 109*).—Some special technical features of dairy leases of various types are discussed and a form of lease is given.

The landlord's and the tenant's share, J. D. BLACK (*Hoard's Dairyman, 59* (*1920*), *No. 3, pp. 105, 124, 125, 132, fig. 1*).—Rent is regarded as the price paid in the case of farm land for a year's use of land and improvement. determined by demand and supply and based on each year's prospective income rather than on land values. The landlord occupies the place of middleman and requires an income. It is shown that on 1,185 cash-rented farms in Wisconsin, the landlord's average net income was 2.45 per cent of the market value, or according to another study in Minnesota 2.5 per cent, and in Iowa 2.3 per cent, which figures are low considering that increase in value and interest on investment are included in the figuring. The tenant's net incomes are similar to those made by owner operators.

Some problems of share rental are briefly discussed.

Compensation for farm managers, A. BOSS (*Hoard's Dairyman, 59* (*1920*), *No. 3, pp. 110, 111*).—A profit-sharing contract is presented as having proved effective in instances where it was tried. The terms are illustrated with a case wherein A provides a farm of 320 acres fully stocked and equipped and valued at $50,000; B and his wife agree to work for $55 a month and board, and 25 per cent of the difference between the receipts and expenses at the end of the year. Under this proposal if the undivided profits were $2,800, the hired manager would receive a total of $1,300 in cash and board for himself and wife for a year. The farm owner would receive as his return $2,100, or a litle over 4.2 per cent on the investment.

Where the farmer touches city labor, J. A. STEVENSON ([*Winnipeg*]*: Canad. Council Agr., pp. 4*).—The author emphasizes what he asserts to be the common economic interests of urban working classes and rural producers in the defeat of the protective tariff in Canada.

The Federal farm loan act, W. G. MCADOO (*Successful Farming, 19* (*1920*), *No. 3, pp. 11, 62–65, fig. 1*).—Attacks upon the tax exemption feature of the Federal farm loan system are refuted. Amendments to the act are suggested, limiting loans by joint stock land banks to farmers who will actually engage in the cultivation of the land and for live-stock equipment and improvement. and confining the amount of loans by those banks to a single borrower to not more than $50,000.

Future of the Federal land bank bonds, W. H. JOYCE (*Univ. Cal. Jour. Agr., 6* (*1920*), *No. 2, p. 11*).—Some precautions to be considered in recommending loans for increasing and promoting agricultural development in California are given. Among those mentioned are that trees and vines can not be considered permanent security, that loans can not be made on land impregnated with excessive alkali or unproved lands underlaid with hard pan, and that there must be the assurance of a permanent and adequate water supply and drainage systems providing for a rising water table.

Suggestions for a State law providing for the organization of farmers' mutual fire insurance companies, V. N. VALGREN (*U. S. Dept. Agr., Dept.*

Circ. 77 (1920), pp. 8).—A draft prepared at the special request of, and in cooperation with, a committee of the National Association of Mutual Insurance Companies is published here.

Importance of Bavarian cooperative societies, K. F. von Frenberg-Jetzendorf (*Landw. Jahrb. Bayern, 5 (1915), No. 1, pp. 1–12*).—In this article are discussed the origin and development of cooperative organizations, particularly agricultural societies in Bavaria. It gives, also, details of the business transacted for several years showing the increase, with figures for Germany for the sake of comparison.

The social survey, its history and methods, C. C. Taylor (*Univ. Missouri Bul., 20 (1919), No. 28, pp. 91, fig. 1*).—This is a key to the purposes and origin, technique, technology, possibilities, and limitations of the social survey. Among the sample schedules and questionnaires included in the appendix, a questionnaire for a rural church survey is given, and the bibliography comprises references to rural, urban, and general studies made on the survey basis.

The Market Reporter (*U. S. Dept. Agr., Market Rptr., 1 (1920), Nos. 5, pp. 65–80; 6, pp. 81–96, fig. 1; 7, pp. 97–112, fig. 1; 8, pp. 113–128; 9, pp. 129–144*).—Current market reviews for live stock and live-stock products, fruit and vegetables, seeds, grain, hay and feed, and cotton, and information on foreign markets, are continued in these numbers. The leading articles are on the subjects, respectively, of marketing agencies for cotton seed for planting and the British market for American pork; the importance of advertising in the marketing of farm products and why standard grading pays; Canada and Argentina as competitors with America's dairy products trade and the low available supply of red clover seed; market conditions in Great Britain and celery movement and markets; and the fundamental problems before investigators in marketing, the last being an address by G. Livingston, read before the American Farm Economic Association, Chicago, November 30, 1919.

Third national census (*Tercer Censo Nac. [Argentina], 5 (1919), pp. XIII+978*).—Data in this volume comprise statistics by provinces and territorial subdivisions of agriculture and live-stock farms, classified by area, main project or crop grown, nationality of managers, invested capital, number of persons living or employed on them, and machinery and equipment; of purely agricultural projects by area, time and terms of leasing, and nationality of managers; also of the area sown to cereals, fiber plants, legumes, and vegetables.

AGRICULTURAL EDUCATION.

The agricultural college in the new era (*Agr. Gaz. Canada, 7 (1920), No. 1, pp. 19–29, figs. 8*).—This is a symposium, by the presidents, principals, and deans of the agricultural colleges in Canada, on the functions of the agricultural college in the period following the world war. It comprises the following brief articles: Agricultural Colleges Must Assume New Responsibilities, by M. Cumming; The Agricultural College a Luminous Beacon, by Pere Jean de la Croix; The Agricultural College Must Lead in the Agricultural Era, by F. C. Harrison; Demonstrations Rather Than Lectures, by G. C. Creelman; Training for Good Citizenship, by J. B. Reynolds; Training Needed for Rural Leadership, by W. J. Rutherford; The Dignity of the Profession Must be Promoted, by E. A. Howes; and The Obligation to Prepare Leaders, by F. M. Clement.

The leading thoughts throughout these articles seem to be that the colleges should not only further stimulate and lower the cost of production through their research departments and an increased number of specialists' courses, but through more extended courses in applied economics and social science should also teach students how to live in the country and how to make the country better to live in. They should train students for rural leadership and intelligent citizenship to meet the political and social upheaval following the war. It is suggested that the new farm leaders should promote the advancement of agricultural colleges and of agricultural instruction in the schools, and that the agricultural college staffs should exert themselves to keep ahead of this great agrarian movement and so retain their positions as leaders in that education which will give the power which rightly belongs to those whose activities constitute the foundation of the country's development and the basis of national prosperity.

Training teachers of agriculture (*U. S. Bur. Ed. Bul. 66* (*1919*), *pp. 44*).—This bulletin contains the following papers and committee report on the Relation of General Science to Agricultural Instruction, presented at the ninth annual meeting of the American Association for the Advancement of Agricultural Teaching, held in Baltimore January 7, 1919, which have been previously noted (E. S. R., 40, p. 398): Training Teachers After Employment, by R. W. Stimson; Improvement of Teachers in Service, by J. T. Wheeler; Organization for Teacher Training in Agriculture, by C. D. Jarvis; An Emergency Course for the Preparation of Teachers of Vocational Agriculture, by W. F. Lusk; and Emergency Course for Training Agricultural Teachers in South Carolina, by V. Peterson.

The association adopted resolutions heartily approving of the practice of training teachers while in service, strongly emphasizing the need in the teacher-training institutions for adequate facilities for practice teaching in agriculture, and recommending, as one of the suitable methods, the plan which provides for the actual employment of prospective teachers as apprentices as a part of their collegiate training.

General science in the agricultural high school, F. E. HEALD (*Gen. Sci. Quart.*, *3* (*1919*), *No. 3*, *pp. 160–165*).—The author suggests the following three ways of viewing the relationships between general science and elementary agriculture:

"(1) They may be more or less interchangeable, one being a reasonably good substitute for the other. (2) There may be no possible relationship between them, any more than between two isolated subjects of the curriculum. (3) They may be equally necessary courses for some schools, and the correlation or coordination of the two subjects the only rational arrangement."

The specific aims of the course in introductory or general science are stated, including that of making the transition from the nature study methods of the grades to the real scientific attitude and method. This need not be done by following the usual methods in high-school science, but rather by developing the scientific spirit of open-mindedness, willingness to investigate, the habit of observing closely, recording accurately, searching authorities, and verifying conclusions by further observation. It is found that so many of these aims would apply as well as aims for the course in elementary agriculture of a general nature, that the latter might be accepted in a community where only one year of agriculture is given or where the agriculture is for academic rather han vocational purposes. A list of suggested practicums for gaining skill is ncluded.

The author holds that if a course in general science is so organized as to take ognizance of local problems and at the same time to correlate with other subects in the first year program, the teacher in general science and the teacher f agriculture will be able to unify the items of interest and prevent much of ach subject from being over the heads of the students. From his observation of several hundred schools, he is convinced that where the teachers are well informed and have in mind the proper aims both as to their own subjects and as to correlating with their colleagues, this method of two parallel courses is by far the best.

Vocational education: Teacher-training course in home economics for experienced home makers, 1919 (*Cal. State Bd. Ed. Bul. 23–A, Sup.* (*1919*), *pp. 8*).—The minimum requirements for this 2-year course, including 10 basic units of work, are given, and a suggested type of examination is outlined.

Documents relating to vocational education (*Cal. State Bd. Ed. Bul. 23-A* (*1919*), *pp. 80*).—This bulletin, which is a revision of one previously noted (E. S. R., 40, p. 394), contains the regulations and requirements relating to the administration of the Federal and State vocational education acts in California for 1919–20. Under this plan the California State Board of Education will cooperate with the University of California in the training of vocational teachers of agriculture, and with the Southern California Branch of the University of California and the State normal schools authorized to train high-school teachers in household arts subjects in the training of women who have had practical experience in household duties and home management as vocational teachers of home economics. The University will maintain, in connection with and under the direct supervision of the school of education, training classes for teachers of vocational agriculture, each in charge of a supervisor, at one or more of the following places: The Kearney Farm in Fresno County, the Citrus Experiment Station in Riverside County, and the Davis Farm in Yolo County.

Progress in elementary agricultural education (*Agr. Gaz. Canada, 7* (*1920*), *Nos. 1, pp. 46–54, figs. 3; 2, pp. 150, 151*).—This is a series of brief articles by education officials on progress in elementary agricultural education in the Provinces of Nova Scotia, Quebec, Ontario, Saskatchewan, Alberta, and British Columbia.

In Nova Scotia, 10 traveling teachers for doing rural science work are employed instead of paying grants to regular teachers for such work, the change having been found an improvement. Rural science has expanded from school gardening to include all phases of homemaking.

In Quebec, agriculture is taught regularly in all primary schools beginning with the third year of the course, and is also included in the course of the normal schools. In the first and second years of the primary schools elementary principles under the heading of object lessons are given on plants, animals, and the farm in general. School gardens and school fairs are found in a large number of districts. In 1917–18 there were 52 domestic science schools attended by 7,469 pupils. In rural domestic science schools, which are in a majority, the course includes fairly complete principles of agriculture, including the care of the garden, poultry, dairying, spinning and weaving wool, etc.

In Ontario, the laboratory method in agricultural instruction is employed as far as possible. The subject of agriculture is optional in the high schools, 33 of which are conducting such work in spite of the heavy course of obligatory subjects. In 1919 some 1,500 public and separate schools, both rural and urban, conducted classes in agriculture and qualified for grants. The work was begun in 1903 with 4 schools. Nature study is an obligatory subject in the public and separate schools.

In the Saskatchewan course of study, nature study is taught from grades 1 to 6, inclusive, and agriculture in grades 7 and 8. A type of short course in agriculture for farm boys is being developed successfully. A definite course in agriculture for the high schools is in preparation for the fall session of 1920.

In Alberta, instruction in agriculture is given in grade 11 of the high schools and in grades 7 and 8 in the elementary schools. Nature study is given in grades 1 to 6. Teachers receive instruction in agriculture in the normal schools, and may obtain an elementary certificate in this work after two seasons' study at the summer school.

It is stated that better methods of instruction in nature study and elementary agriculture are becoming more evident in the schools of British Columbia.

How to feed for bigger live-stock profits (*Pleasant Hill, Ohio: Live Stock Feeding Assoc., 1919, Lessons 1, pp. 38, figs. 34; 2, pp. 36, figs. 21; 3, pp. 38, figs. 23; 4, pp. 47, figs. 33; 5, pp. 37, figs. 16; 6, pp. 43, figs. 26; 7, pp. 48, figs. 25; 8, pp. 62, figs. 42; 9, pp. 69, figs. 78; 10, pp. 67, figs. 57*).—This course of 10 illustrated lessons, prepared by the Live Stock Feeding Association of Pleasant Hill, Ohio, and intended to cover the entire science of correct animal feeding, deals with the relation of feeds and feeding to raising live stock for profit; the fundamentals of feeding roughages; raising horses, beef cattle, sheep, swine, and poultry for profit; and dairy farming.

Nature study in the grades, G. B. GOLDSMITH (*Gen. Sci. Quart., 3 (1919), No. 3, pp. 167–185*).—The author briefly discusses the aims, method, and correlation of nature study, and outlines suggestive nature studies in plant and animal life, arranged by seasons, through grades 1 to 8, inclusive.

How the Cornell Rural School Leaflet hopes to teach conservation through nature study, E. L. PALMER (*Nature-Study Rev., 16 (1920), No. 2, pp. 65–72, figs. 2*).—The policy to be followed in the publication in teaching conservation and patriotism, namely, by organizing nature study material in an attractive and logical manner, is outlined.

Conventions of the Ontario Women's Institutes and Federated Women's Institutes of Canada, 1919 (*Ontario Dept. Agr. Circ. 25 (1919), pp. 40*).—This circular contains a summarized report of the Eastern, Western, and Central Ontario 1919 conventions of the Women's Institutes Branch of the Ontario Department of Agriculture, including resolutions passed, officers and board of directors of the provincial federation, etc.

School fairs in 1919 (*Agr. Gaz. Canada, 7 (1920), Nos. 1, pp. 55–56, figs. 2; 2, pp. 156–158*).—A series of reports on the school fair work in 1919 in Quebec, Ontario, Saskatchewan, Alberta, and British Columbia. A brief description is given of a county product map competition, a new feature in the school fair work of Middlesex County, Ontario.

MISCELLANEOUS.

Work and expenditures of the agricultural experiment stations, 1918, E. W. ALLEN, E. R. FLINT, and J. I. SCHULTE (*U. S. Dept. Agr. [Rpt.] Work and Expenditures Agr. Expt. Stas., 1918, pp. 80*).—This report consists mainly of a discussion of the activities of the stations and the use made by them of the funds granted by the Federal Government under the Hatch and Adams Acts, including the usual detailed statistics compiled from official sources as to the organization, revenues, additions to equipment, and expenditures of the stations.

During the fiscal year ended June 30, 1918, the total income of the stations, including those in Alaska, Hawaii, Porto Rico, and Guam, was $6,215,681.65. Of this amount $719,896.54 was derived under the Hatch Act, $719,999.84 under the Adams Act, $155,000 from the Federal appropriations for the insular stations, $2,716,205.36 from State appropriations, $17,815.40 from individuals and communities, $216,686.47 from fees, $918,466.34 from the sale of products, and $751,508.08 from miscellaneous sources.

The value of additions to the equipment of the stations during the year is estimated as $906,552.38, of which $417,053.24 was for buildings.

The stations employed 1,684 persons in the work of administration and inquiry. Of this number, 897 were also members of the teaching staff of the colleges, and 449 assisted in the various lines of extension work. During the year the stations published 796 annual reports, bulletins, and circulars, aggregating 21,954 pages, and these were distributed to 1,030,105 addresses on the regular mailing list.

Report of the Porto Rico Insular Station, 1919 (*Ann. Rpt. Insular Expt. Sta., Dept. Agr. and Labor, Porto Rico, 1919, pp. 38*).—This contains the organization list, a report by the director for the fiscal year ended June 30, 1919, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Quarterly bulletin of the Michigan Experiment Station, edited by R. S. SHAW and H. W. NORTON, JR. (*Michigan Sta. Quart. Bul., 2 (1920), No. 3, pp. 105–153, figs. 16*).—In addition to articles abstracted elsewhere in this issue, this number contains the following: Farm Accounting; Produce Better Wool, Cooperative Marketing of Wool—Other States Have Saved Thousands of Dollars—Why Can't Michigan? and Dipping Sheep, all by G. A. Brown; Suggestions on Winter and Spring Care of the Brood Sow, by W. E. J. Edwards; Inoculation of Legumes, by R. L. Snyder; Oat Smut Again Makes Treatment Necessary, and Treatment for Barley Diseases, both by G. H. Coons; The Brown Swiss Herd of the Michigan Agricultural College, by J. E. Burnett; Termites in Buildings (*Leucotermes flavipes*), by E. McDaniel; Tree Planting Along Highways; Care and Repair of the Farm Tractor, by E. C. Sauve; The Seed Plot as a Factor in the Improvement of the Potato Crop, by H. C. Moore; Navel Ill in Colts, by E. T. Hallman; and The English Sparrow in Michigan, by A. C. Conger.

Monthly Bulletin of the Ohio Experiment Station (*Mo. Bul. Ohio Sta., 4 (1919), No. 8, pp. 235–263, figs. 5*).—This number contains, in addition to several articles abstracted elsewhere in this issue and miscellaneous notes, the following: Wheat Scab Serious in 1919, by A. D. Selby.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta. Mo. Bul., 7 (1920), No. 11, pp. 177–192, figs. 6*).—In addition to articles abstracted elsewhere in this issue, this number contains brief articles on the following subjects: Help Beautify Western Washington, by J. L. Stahl; Maintaining the Winter Milk Flow, by L. E. Carter; and Baby Chicks (including feeding charts and other suggestions), by Mrs. G. R. Shoup.

NOTES.

California University and Station.—What is known as the Deciduous Fruit Station has recently been established as a part of the field activities of the division of pomology. A tract of 2.4 acres, with a house and outbuildings, has been leased for five years at Mountain View in the Santa Clara Valley, about 50 miles south from Berkeley. Among the immediate problems under consideration are the control of apricot brown rot, a disease that has been playing havoc in recent years; the brown apricot scale, which has been a serious pest on prune and apricot trees; the red spider on prune and cherry trees; thrips on prunes; Armillaria or oak fungus, a disease of the soil which is killing large numbers of fruit trees in many of the fruit sections of the State; root stocks for deciduous trees; pruning for early and heavy fruiting of all deciduous fruits; rejuvenation of old fruit trees by special pruning methods, and the improvement of fruit varieties by selection. Some notable results have already been secured this winter in the control of the brown rot of the apricot and brown apricot scale, and the control of thrips in prune and other trees. These studies constitute a part of the station's work with deciduous fruits, for which $100,000 was appropriated by the last legislature for the ensuing biennium.

A tract of land has also been leased near Placerville for experimental work in cattle ranging.

Florida Station.—*Science* notes that Philip A. Macy, assistant chemist, has resigned to engage in commercial work.

Hawaii College.—J. H. Midkiff, assistant professor of agriculture, resigned February 1 to engage in field work for the Hawaiian Sugar Planters' Station.

Illinois University and Station.—Dr. William L. Burlison, professor and chief of crop production, has been appointed head of the department of agronomy to fill the vacancy caused by the death of Dr. Cyril G. Hopkins.

Kansas College and Station.—The college department of physics is furnishing weather forecasts by wireless each weekday. It is thought that many farmers and others will avail themselves of this service by the installation of receiving apparatus at a cost of about $35.

Harry L. Kent, principal of the school of agriculture, has been appointed chief of the Fort Hays substation, vice Charles R. Weeks, who has become head of the Kansas State Farm Bureau. Herschel Scott, instructor in soils, has resigned to engage in commercial work. Dr. Roger C. Smith has accepted an appointment as assistant professor of entomology.

Minnesota University and Station.—H. W. Vaughan, professor of animal husbandry and animal husbandman, has resigned to become one of the editors of the *Duroc Digest*, the resignation becoming effective at the end of the college year. Otto Kinneberg, clinical assistant in veterinary medicine, resigned April 1 to engage in veterinary practice.

Montana College and Station.—O. B. Whipple, professor of horticulture and horticulturist, has resigned to engage in farming in Colorado.

Nebraska University and Station.—The new agricultural engineering building was formally dedicated April 14. Construction was originally started in 1916 and it was utilized for war training work while incomplete, becoming available for regular class work last spring.

The building is a 2-story and basement fireproof structure, costing with equipment about $240,000. The main portion is 180 by 76 ft. with a 1-story annex 84 by 140 ft. The basement floor is devoted mainly to testing laboratories and storage purposes. On the first floor of the main building are the farm machinery and carpentry laboratories, and in the annex the forge shop, a large lecture room, and laboratories for farm motors and automobiles, farm grain handling, farm lighting, and farm hydraulics. The second floor is utilized chiefly for offices and classrooms and an agricultural physics laboratory.

New Mexico College.—R. W. Clothier, formerly of the Arizona University and Station and later with the Office of Farm Management, U. S. Department of Agriculture, has been appointed president and has entered upon his duties.

New Jersey Stations.—A tuberculosis-free accredited herd certificate has been awarded the college farm dairy herd by the Bureau of Animal Industry, U. S. Department of Agriculture.

Under the auspices of the Somerset-Hunterdon Holstein-Friesian Association, the local county agent, and the college authorities, an auction sale of 65 head of registered Holstein cattle was held in the sales pavilion of the college farm March 19. This sale proved to be very successful.

The agricultural students of the college are planning to hold a fair some time in May for the purpose of bringing the activities of the college before the people of the State.

H. R. Cox has been appointed extension specialist in soils and farm crops, vice J. B. R. Dickey, beginning April 1.

Cornell University.—John C. Maddy, extension instructor in animal husbandry, and Mark J. Smith, assistant extension professor of animal husbandry, have resigned to engage in farming. Walter G. Krum, extension instructor in poultry husbandry, resigned April 1 to take charge of a country estate in Westchester County, N. Y.

Pennsylvania College.—A department of poultry husbandry is to be established July 1, in charge of H. C. Knandel, at present assistant professor of poultry husbandry extension.

Virginia College and Station.—The State Legislature has made substantial increases in the appropriations for the college and extension division, but no change in the appropriation for the station.

Hampton Institute.—In common with other negro agricultural schools the curriculum of this institution has hitherto been mainly of secondary grade. Since the passage of the Smith-Lever and Smith-Hughes Acts, however, the demand for county agents and teachers of agriculture has increased greatly, and with the hope of thoroughly equipping men to fill these positions announcement is now made that beginning in September an agricultural course of college grade will be offered. Fifteen units of secondary work and two years of actual farm life and experience are to be required for entrance. Instead of four years of 9 months each, the new course will require three years of 12 months each, thereby making it possible to give the necessary field practice in the summer months. Warren K. Blodgett, extension assistant professor of rural engineering at Cornell University, has been appointed director of agricultural work.

Ohio C. Barber Agricultural and Industrial School.—Under the will of the late Ohio C. Barber, the bulk of his estate is bequeathed to five trustees, with instructions to found and incorporate as soon as possible the Ohio C. Barber Agricultural and Industrial School. This school is to be located on Mr. Barber's 2,000-acre farm at Barberton in Summit County, Ohio, known as the Anna Dean Farm. The farm is said to possess one of the most elaborate and imposing sets of permanent farm buildings to be found in this country, and is valued at approximately $4,000,000.

The school is expected to become affiliated with Western Reserve University, its president, Dr. C. F. Thwing, being named as one of its trustees. The will provides "for education along agricultural and industrial lines and all things pertaining thereto, for the benefit of men and women of this and all succeeding generations, to aid them in becoming industrious and useful citizens, and especially looking to the development and proper treatment of the soil as well as to the development of manufacturing industries connected or affiliated therewith."

Provision is made for the location on the grounds of other schools or institutions of kindred purpose.

Cinchona Tropical Botanical Station.—The Smithsonian Institution has resumed its lease of this station, which is located on the southern slope of the Blue Mountains of Jamaica, and it announces that the privileges of the garden will again be available for American botanists. The laboratory includes a well kept botanical garden of 10 acres containing scores of exotic trees, shrubs, etc., and a plantation of 6,000 acres containing cinchona, tea, coffee, and rubber trees, Eucalyptus, and many other species. Nearby is an undisturbed montane rain forest, with an almost impenetrable jungle of tropical vegetation.

Research Institute for New Zealand.—Under a bequest of the late Thomas Cawthorn, of Nelson, New Zealand, about $1,200,000 is available for the founding of Cawthorn Institute. A site of about 20 acres, near Nelson and overlooking Tasmania Bay, has been secured, and building will be commenced at an early date. T. H. Easterfield, professor of chemistry in the University of New Zealand, has been appointed director and T. Rigg, of the Cambridge University School of Agriculture, agricultural chemist. The chief work of the institution is to be "instruction in and performance of scientific research; such research to be definitely related to the industries of Nelson and of the Dominion."

Reorganization of British Board of Agriculture and Fisheries.—Under an act recently passed by Parliament the Board of Agriculture and Fisheries has been replaced by a Minister of Agriculture and Fisheries. Councils of agriculture are also provided for England and Wales, and an agricultural advisory committee for both countries. The official organ, *Journal of the Board of Agriculture*, has been rechristened the *Journal of the Ministry of Agriculture*. Lord Lee has been appointed Minister of Agriculture and Fisheries.

The councils of agriculture provided are to include representatives of local agricultural committees and nominees of the ministry itself. Labor, women, horticulture, agricultural education and research, and the Agricultural Wages Board are to be represented on these councils, which will meet twice a year. The advisory committee is a smaller body, meeting quarterly or oftener and consisting of 12 members nominated in part by the English and Welsh councils and in part by the ministry. There will also be a local agricultural committee for each county, partly nominated by the ministry.

Agricultural Education and Research in Great Britain.—The Seale Hayne Agricultural College at Newton Abbot in Devon resumed regular courses of instruction in agriculture in January. A 3-year diploma course in agriculture, a 2-year certificate course in agriculture and horticulture, and short courses in poultry husbandry, dairying, and similar subjects are being offered.

Lord Iveagh has purchased an estate of about 500 acres at Chadacre Hall, Suffolk, and is equipping it as a farm school for about 40 or 50 boys. The school is intended primarily for sons of poor parents, particularly farm laborers, but provision is also made for sons of small holders and others. Board, lodging, and instruction are to be entirely free.

The Institute of Research in Animal Nutrition at Aberdeen has been given $50,000 by J. Q. Rowett toward its goal of $125,000.

Training Returned Soldiers in Canada.—At Kentville, N. S., about 30 men received training during the past year. One hour daily was devoted to lectures on agriculture and three hours to live stock work, and the remainder of the time to practical handling of farm crops.

Two 12-weeks' courses were given at Fredericton, N. B., to 35 men. Several lectures a week were offered, as well as live stock judging, spraying, and other demonstrations and a large amount of practical field work.

A completely equipped farm of 150 acres, belonging to the experimental farm at Lennoxville, Quebec, was taken over temporarily by the Soldier Settlement Board for use in training work. About 70 men received instruction on this farm.

Italian Forestry Instruction.—In a recent issue of the *Journal of Forestry* a description is given by N. C. Brown of the organization and work of the Royal Italian Forestry College, together with information regarding the reorganization of technical education in forestry in Italy, which has been entirely rearranged in accordance with important reforms in the laws of 1910, 1911, and 1912.

It appears that in Italy forestry education is entirely in the hands of the central government at Rome, is supported by funds from the general forestry appropriation, and is supervised by the Director General of Forests under the Minister of Agriculture. It dates back to 1869, when the old Benedictine monastery at Vallombrosa was given over to the Royal Forestry Institute which, in spite of limited funds for educational purposes, flourished, and has turned out an excellent type of technical forester.

Under the laws of 1911 the school was moved to the Cascine Gardens in the outskirts of Florence, and its official name was changed to "Reale Istituto Superiore Forestale Nazionale," or the Royal Forestry College. Since its permanent establishment there in 1913 it has received an annual appropriation of about $40,000. In accordance with later legislation, the college has two essential functions, viz, didactics, and study and experimentation. It provides a two-year graduate course in professional forestry for graduates of recognized engineering and agricultural schools, and also confers diplomas of professional efficiency upon those who have attained particular proficiency in the technical work of the State administration.

The students in the regular course are officially a part of the royal corps of foresters and are admitted to this school only as such. On the successful completion of competitive examinations they are given the title of adjutant assistant inspector of forestry in the Royal Forestry Corps and receive a yearly stipend of about $500 for maintenance.

Each of the two years of the course of study is divided into the scholastic period in Florence from October 15 to June 15, and the period for field activity and inspection work from July 1 to September 30, the remaining time being available for vacations. At least one-half of the time and efforts of the faculty are expected to be devoted to scientific investigation and experimentation, the character of which is determined and supervised by an academic board under the general direction of the Director General of Forestry at Rome.

There are also two ranger schools located, respectively, at Citta Ducali, in the Abruzzi, near Aquila, and at Vallombrosa. Both offer one-year courses. There are three degrees, viz, forest guard, forest brigadier, and forest marshal. When ranger students have completed the course at the Citta Ducali school they enter the forest service as guards. After a period of three years in the forest, selected competent students are sent to the Vallombrosa school, and on completion of the one-year course receive the degree of forest brigadier. A few of the most proficient men receive the degree of forest marshal. Students at the

Citta Ducali school receive about $320 a year and those at the Vallombrosa school approximately $360 a year upon graduation as brigadiers, while those who receive the degree of forest marshal are given about $480 a year and 40 cents extra per day for subsistence.

Extension of Agricultural Home Economics Instruction in Belgium.—The Minister of Agriculture in Belgium has appointed in each Province a woman State adviser of agricultural home economics instruction, chosen from among the instructors of itinerant agricultural home economics schools. The duties of these advisers will be to promote economic and social progress in rural districts, and to aid farm women in the better fulfillment of their duties as the mothers of families, housekeepers, and collaborators of the farmers in the field and in agricultural social work. This will be done principally by means of lectures and demonstrations, verbal and written advice, efforts to promote the success of the temporary agricultural home economics schools, the organization of professional agricultural unions for farm women, visits to markets, etc.

As the result of a study in foreign countries last summer by the inspectors of agricultural home economics instruction in Belgium, there will be opened in October, 1920, a State higher normal institute of agricultural home economics. The object of this institute will be not only the training of teachers of agricultural home economics but also of giving farmers' daughters an opportunity to receive instruction in this subject and of developing in them a love for country life. It will comprise Flemish and French sections, and applicants for admission must possess a teacher's diploma or certificate of secondary studies or their equivalent. The instruction, which will be theoretical and practical, will be distributed over five semesters, and will include religion; psychology; pedagogy; applied natural sciences, anatomy, biology, physiology, and hygiene; domestic economy, nutrition, sewing, home management, and rural esthetics; gardening, poultry raising, care of domestic animals, dairying, and cheese making; small rural industries; elements of social economy, law, commerce, and accounts; literature and languages; and arts.

Proposed Home Economics Work in the American College for Girls at Constantinople.—The international committee on teaching home economics of the American Home Economics Association is formulating plans for a department of home economics in the American College for Girls at Constantinople. This institution is the only one in the Near East offering vocational work to women, and has at present 560 students of 18 nationalities. Several courses in agriculture and home economics are already being offered. The association has voted to raise a fund of $6,000, and to send out an American professor for three years.

Southwestern Division of the American Association for the Advancement of Science.—A southwestern division of the American Association has recently been formed, and among other activities is arranging to have lectures given from time to time in at least four localities, Tucson, Ariz., Albuquerque, N. Mex., Mesilla Park, N. Mex., and El Paso, Tex. It is hoped to utilize in part the services of scientific men who may be passing through the vicinity. Dr. Elliott C. Prentiss, 1515 Roberts-Banner Building, El Paso, Tex., is in charge of the matter at present.

Necrology.—Dr. Charles Gordon Hewitt, Dominion entomologist and consulting zoologist, died in Ottawa February 29 at the age of 35 years. Dr. Hewitt was a native of England, receiving the degree of D. Sc. from the University of Manchester. He came to Canada in 1909 as Dominion entomologist, and had been largely responsible for the notable progress made in developing a complete Federal entomological service.

Dr. Hewitt was widely known among entomologists, being president of the American Association of Economic Entomologists in 1913 and a fellow of several entomological and ornithological societies. The gold medal of the Royal Society for the Protection of Birds was awarded to him for his efforts in connection with the treaty between Canada and the United States for the protection of migratory birds. He was the author of two well-known books on the house fly and many reports and bulletins, and had just completed an important work on the Conservation of the Wild Life of Canada.

The recent death of Dr. John Wilson, lecturer in agriculture and rural economy in the University of St. Andrews, Scotland, in the words of *Nature* "robs the university and science of a keen and brilliant agricultural biologist. Dr. Wilson was one of the few who regarded agriculture as a sister science of biology rather than as a branch of chemistry, and his work on the improvement of farm crops has borne excellent fruit." He had worked particularly with potatoes, turnips, and oats, developing a very large number of new varieties.

William Hill, organizer and director of the agricultural department of Bethany College, West Virginia, died February 29 at the age of 55 years.

New Journals.—The Ecological Society of America has taken over *Plant World*, which is to be rechristened *Ecology*, issued as the official organ of the society, and published in cooperation with the Brooklyn Botanic Garden. It is to be a quarterly journal for the presentation of original articles, the first number being that for March, 1920, with Barrington Moore as editor in chief.

The *North American Veterinarian* is being issued monthly, and comprises editorial discussions, leading articles, reviews, case reports and other articles, notes, etc. The initial number contained as leading articles Traumatic Pericarditis of the Ox, by T. H. Ferguson; A Plea for Standard Methods of Estimating the Number of Killed Bacteria in Suspension, by W. E. King and R. E. Vories; Handling of Stock Hogs, by A. T. Kinsley; and Sterility of Cows and its Treatment, by H. Lothe.

The *Journal of the Museum of Comparative Oology* is being published by this museum, located at Santa Barbara, Cal. The initial number is devoted mainly to a description of the museum and its work, which is stated to be that of "accumulating the phylogenetic evidences offered by the eggs of the birds of the world."

The Oregon Grower is being issued monthly as the house organ of the Oregon Growers' Cooperative Association in the interests of the commercial fruit and nut growers of the State. C. I. Lewis, formerly of the Oregon College and Station and now organization manager of the association, is editor.

1920 Convention of Association of Land-Grant Colleges.—Announcement is made that the thirty-fourth annual convention of this association, formerly the Association of American Agricultural Colleges and Experiment Stations, will meet at Springfield, Mass., October 20–22, with headquarters at the Hotel Kimball.

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EXPERIMENT STATION RECORD.

VOL. 42. JUNE, 1920. No. 8.

Many months have now gone by since the cessation of hostilities, and the return of the American Expeditionary Forces from Western Europe, yet interest is still keen in this country in the tremendous problems involved in the reconstruction of France and Belgium. Most of the territory actually laid waste on the Western Front was primarily devoted to agriculture, and the physical restoration for farm purposes of this great area constitutes in itself a most extensive reclamation enterprise. Of even greater magnitude, however, and in several ways more complicated and farreaching, is the adjustment of agriculture and rural life in the remainder of France and Belgium to postwar conditions.

The need of a comprehensive rehabilitation program has been quite generally recognized in these countries, and plans were under way before the signing of the Armistice for a bringing together of the various agricultural agencies. Eventually two notable agricultural congresses were held, the printed proceedings of which have recently been issued. The first of these was the French Agricultural Congress, which met in Paris from June 30 to July 3, 1919. This was followed by the National Congress for the Agricultural Restoration and Betterment of Rural Life in Belgium, which met from September 28 to October 1, 1919, at Brussels. These two congresses were distinct, each working along national lines, but naturally they had many things in common and can conveniently be discussed together.

The French congress was sponsored by the National Society for the Encouragement of Agriculture, whose executive council adopted on October 24, 1918, a resolution advocating "a grand agricultural congress of the principal agricultural societies and associations of France to determine the objectives of a campaign to restore the agriculture of the nation, particularly in the devasted regions." An announcement sent out by the society a few weeks later drew attention to the advisability of a comprehensive survey of the situation, and suggested the assembling of representatives of these bodies as a sort of legislature of agriculture to coordinate the efforts of the various agricultural agencies of the nation.

The congress was participated in by over five hundred delegates, representing mainly the national and local societies and similar bodies, the agricultural and viticultural "syndicates," and the rural cooperative, credit, and insurance organizations. Prominent among the participants were the representatives from the Provinces of Alsace and Lorraine. A delegation was also in attendance from the Grand Duchy of Luxemburg, and Belgium was represented by M. Paul de Vuyst, Director General of Agriculture. The presiding officer was M. Émile Loubet, former President of the French Republic and head of the National Society for the Encouragement of Agriculture, who had already served for several months as chairman of the organization committee. The first speaker was M. Victor Boret, Minister of Agriculture and Food Supply, and many other agricultural leaders shared in the deliberations, making the assembly unusually representative and influential.

The Belgian congress was organized under the auspices of the National Commission for the Betterment of Rural Life. This body, it may be recalled, was established in 1913 following the development of the "Village Moderne," or Model Rural Community, at the Ghent Exposition.[1] Its fundamental purpose was to foster on a permanent basis the improvement of rural and village life, and at the outbreak of the war it had completed preliminary arrangements for a congress on this subject to be held in the fall of 1914. After the invasion of Belgium, however, it resolved itself into the Central Commission for the Study of Rural Reconstruction, cooperating with the agricultural section of the National Committee of Assistance and Food Supply. Its initial meeting was held in January, 1915, and this was followed by others at regular intervals and the steady prosecution of surveys and studies of reconstruction problems. In cooperation with other bodies, among them the Central Society of Architects of Belgium and local reconstruction committees, plans were developed in considerable detail for rebuilding farm structures, rural churches, schools, and other public buildings, and efforts were made to be as well prepared as possible to resume the national life when the invaders' armies should be withdrawn. The holding of the congress here discussed was a logical step in this carefully considered national program.

The aggregate attendance at Brussels was approximately the same as at the French congress, but the basis of organization differed considerably. Although all individuals and institutions interested were eligible to membership, most of the delegates were from the several branches of the national, provincial, and local governments, the village burgomasters being quite commonly selected. The various agricultural federations, official agricultural societies, and related bodies constituted another important group, and special provision was made for the educational and research institutions. About thirty-five of these institutions were represented, headed by the Institute of Chemistry and Agricultural Physics of Gembloux, and including the State Botanic Garden at Brussels, agricultural and horticultural schools, normal schools, and the agricultural housekeeping schools so typical of Belgium. A wide range of agricultural interests was thus assembled, and the congress vied with the French congress in the representative character and renown of its personnel.

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[1] E. S. R., 30, p. 301.

The broad scope of the two congresses is indicated by their sectional organization. Each congress had a section on the restoration of the devasted regions, and this subject was obviously one of the most urgent and important under consideration. The remaining sections of the French congress dealt with the national livestock situation, the relations of farmers to governmental agencies, farm labor, colonial agriculture, and miscellaneous questions. There was also a section for general questions in the Belgian congress, but its distinctive trend toward rural sociological questions is shown by its provision of sections on the improvement of rural public services, the beautification of villages, and the betterment of rural life.

The principal conclusions of the congresses were embodied in very extensive resolutions, which constitute in effect bases for the elaboration of a national agricultural reconstruction program. Those of the Belgian congress embraced no fewer than one hundred and thirty-six separate items, and those from the French congress are nearly as numerous. Many of the subjects covered were of course primarily of local interest, but not a few dealt with principles and policies of much wider application.

Thus, in regard to the restoration of the devasted territory the French congress laid much stress on the importance of expert assistance. It favored the unification of the administrative forces of the government into a single reclamation service, with a specialist in charge of agricultural reconstruction and a competent staff of employees. In addition the formation of central and national advisory councils was advocated to represent the farmers and their problems, and also the provision of committees of experts to assist farmers in their purchases of livestock and in other ways.

Similarly the Belgian congress, after a special excursion to the battlefields of Roulers, Ypres, and elsewhere, laid down the principle that the vast problems of rural reconstruction could not be left to private endeavor but that there must be adequate and systematic assistance from governmental and other sources. The fact was brought out that experimental fields had already been established in the shelled areas, and that tests had indicated that many of these fields could not be restored to their normal productivity in less than five or six years. Detailed suggestions were worked out for both the temporary and permanent rebuilding of farm structures, the reclamation of the devasted lands, and the reconstruction of rural roads, telephones, and other public services. Systematic instruction by lectures and short courses for farmers in these regions was urged, as well as demonstrations and exhibits of building plans, improved farm equipment, and household conveniences. A special rural exhibit was held in Brussels during the congress, consisting largely of models and farm plans worked out for the various provinces, and attracted much favorable comment as a concrete illustration of the kind of assistance available.

The livestock situation was considered by both congresses, but in most detail by the French, who gave it the status of a distinct section. Here again much emphasis was put on the desirability of expert assistance. A commission of farmers, teachers, and veterinarians was proposed to indicate the breeds of cattle and sheep necessary to replace the animals removed by the Germans, and the government was asked to assist in the keeping of the various herd books, to give increased attention to the combating of contagious diseases, to endeavor to develop improved strains of goats, and to establish a special livestock section in the National Council of Agriculture.

Considerable importance was attached by both congresses to the development of agricultural education. At Paris, the subject was considered chiefly in the section of farm labor, the view being expressed that better education and training would reduce the amount of hand labor necessary on the farm. More winter courses, both in fixed and traveling schools, the establishment of farm apprentice schools, and a general redirection of rural education toward the farm were also suggested.

The Belgian attitude is well expressed in the following resolution: "Since moral restoration of the country is even more vital than economic restoration and the perfection of family education is the greatest factor in moral progress, it is of first importance from the standpoint of national welfare to provide for the education of the rural population, assuring everywhere the means for parents and future parents to receive expert preparation." It was further specifically urged that in the interests of efficiency the sons of farmers and farm laborers take courses in professional agriculture and farm mechanics, and that landowners select their managers and directors from graduates of the agricultural colleges. In order to foster market gardening, the organization of "a thorough and regular system of professional education through series of lectures to fourth grade schools, maintenance of demonstration gardens, and similar ways" was favored. The agricultural preparation of teachers in primary schools was indorsed, and a general improvement and modernizing of methods of agriculture was recommended.

The strengthening of agricultural research was only incidentally touched upon in the Belgian program, but at Paris advanced ground was taken in connection with the fostering of colonial agriculture. The congress recommended as a minimum program the establishment of at least one permanent agricultural station for each distinct agricultural region in the colonies. These stations would each include sections of economic botany and plant introduction, plant propagation and distribution, plant diseases, and meteorological observations, a research section, and a section for field testing and demonstrations. Particular insistence was expressed on the necessity of adequate facilities, including laboratories, a library, a museum, and a competent and well-paid personnel, the opinion being expressed that in the past insufficient support had been the most serious handicap to full efficiency.

In addition, it was proposed to supplement these general stations by a series of special research stations for the study of each of the principal colonial products, such as cotton, vanilla, rubber, sugar, coconuts, tea, silk, and livestock. All these stations would be under the immediate supervision of a Bureau of Colonial Agriculture in the Ministry for the Colonies, which would act as a central clearing house of information on colonial agriculture.

Extension work was tacitly accepted by both congresses as an urgent need. One of the Belgian resolutions advocated a system of counsellors for small farmers, with duties somewhat analogous to those of the county agents in this country. Unusual emphasis was put on the need of activities to improve living conditions on the farm and to add to the attractiveness of country life through the provision of home economics and hygiene instruction and the installation of farm conveniences, libraries, and better mail, telephone, and telegraph service, and fire protection. Studies of farmers' dietaries by the experiment stations were suggested as a basis for more precise data for instruction in nutrition. Perhaps most novel of all was the prominence given to what is termed rural esthetics, including a plea for expert instruction in the esthetics of rural buildings, roads, public places, furniture, clothing, and the like.

One outstanding result of the French congress was the immediate formation of a National Federation of Agricultural Associations, with an enrollment of over thirty national and regional bodies. This federation is to be a permanent and active organization, with headquarters in Paris, to serve as a central clearing house for the various agricultural systems in the coordination of their activities and policies and to constitute a single spokesman for their interests. One of its specific duties is to hold annually a French congress of agriculture.

Presumably somewhat similar functions will be performed in Belgium by the National Commission for the Betterment of Rural Life, which is also organized as a continuing body. In that case, means will be available in each country for perpetuating and developing the elaborate programs so carefully formulated. This would seem to be very desirable. A most useful service has already been rendered in assembling the agricultural leaders of the two nations in these congresses, and there will be widespread and sympathetic interest in the working out of the comprehensive policies which were there agreed upon.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Distribution of the basic nitrogen in phaseolin, A. J. FINKS and C. O. JOHNS (*Jour. Biol. Chem., 41 (1920), No. 3, pp. 375–377*).—An analysis of phaseolin by the Van Slyke method is reported from the Bureau of Chemistry, U. S. Department of Agriculture. The nitrogen distribution corrected for solubility of bases was as follows: Amid N 10.89 per cent, humin N adsorbed by lime 1.72, humin N in amyl alcohol extract 0.31, cystin N 0.61, arginin N 12.31, histidin N 5.62, lysin N 9.49, amino N of filtrate 54.94, and nonamino N of filtrate 3.9 per cent. The percentage of basic amino acids was cystin 0.84, arginin 6.11, histidin 3.32, and lysin 7.88. It is pointed out that these results for the basic amino acids were higher, particularly the lysin value, than the results obtained by Osborne and Clapp[1] by the direct method of Kossel and Patten (E. S. R., 15, p. 748).

The constitution of capsaicin, the pungent principle of Capsicum, II, E. K. NELSON (*Jour. Amer. Chem. Soc., 42 (1920), No. 3, pp. 597–599*).—This is a continuation of the study previously noted (E. S. R., 41, p. 310).

The lipolytic activity of the castor and soy bean, A. W. BARTON (*Jour. Amer. Chem. Soc., 42 (1920), No. 3, pp. 620–631*).—The lipases of the castor and soy beans have been studied with respect to their ranges and amounts of activity in an aqueous solution and to their action on lard, olive oil, and ethyl butyrate. It was concluded that with lard or olive oil as a substrate the liberated acids can not be titrated in a water mixture with an aqueous standard solution. This difficulty was overcome by adding, before titration, sufficient ether and alcohol to dissolve all of the fat.

The castor bean lipase was found to be more intense in its action than the soy bean lipase, but both reacted within the same ranges of acidity. Lard and olive oil behaved similarly with respect to enzym activity in the different degrees of acidity. With ethyl butyrate as a substrate, the degree of activity was smaller and the range of acidity higher and shorter than with lard and olive oil.

From these observations the author concludes that both soy and castor beans contain the same lipase or lipases but in different quantity.

An electrically heated bomb for ammonia synthesis, R. O. E. DAVIS and H. BRYAN (*Jour. Indus. and Engin. Chem., 12 (1920), No. 3, pp. 287, 288, figs. 3*).

The sterilization of oils by means of ultra-violet rays, L. T. FAIRHALL and P. M. BATES (*Jour. Bact., 5 (1920), No. 1, pp. 49–66, figs. 4*).—A study is reported of the adequacy of ultra-violet rays for the sterilization of oils to be used in the preparation of lipovaccines. The oils used in the experiments were sweet almond, cottonseed, and olive oil. These were first dried with anhydrous sodium sulphate, filtered, and then inoculated with various spore-forming bacteria or molds and exposed in petri dishes at various distances from the source of the radiation for different lengths of time. The oil was chilled during the exposure by floating the petri dish on ice water. It was found that with this arrangement the oil could be completely sterilized by an exposure of from 3 to 5 minutes at a distance of 10 cm.

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[1] Amer. Jour. Physiol., 18 (1907), No. 3, p. 295.

The method of exposure finally adopted was that of flowing the oil through a spiral tube of transparent quartz having a bore of from 3 to 3.5 mm. and extending the length of the mercury vapor lamp. The spiral tube was inclosed in a gauze jacket over which ice water was allowed to flow from a number of fine jets. The oil was fed into the spiral by gravity and collected in sterile flasks. With this apparatus an exposure of 8 minutes at a voltage of 48, or 3.5 minutes at a voltage of 60, gave effective sterilization. By increasing the voltage to 150, a 4-minute exposure was sufficient. About 1.5 liters of oil could be sterilized in one hour in this way.

Further experiments indicated that the action of lipolytic enzyms in oil is inhibited by exposure to ultra-violet rays. Except for slight bleaching, the oil is in general unchanged physically and chemically by exposure, although in tests with olive oil it was found that exposure for long periods of time increased the acidity of the oil proportionally to the length of exposure.

Effect of the chlorin substitution products of methane, acetaldehyde, and of sodium acetate on catalase production, W. E. and E. L. Burge (*Jour. Biol. Chem., 41 (1920), No. 3, pp. 307–314, figs. 2*).—The introduction of increasing amounts of chlorin into the methane molecule has been found to increase the destructive effect on catalase and its output from the liver as previously noted in the case of chloroform (E. S. R., 42, p. 259). Similarly chloral (trichloracetaldehyde) decreased catalase more than did acetaldehyde, and the introduction of increasing amounts of chlorin into the sodium acetate molecule rendered it less effective in increasing catalase.

"The increase in oxidation following the ingestion of glycocoll, or a closely related compound acetic acid (sodium salt), is attributed to the increase in catalase. The decrease in oxidation arising during chloroform and chloral anesthesia and assumed by some to be the cause of the narcosis is attributed to the decrease in catalase."

Extracts of pure dry yeast for culture media, S. H. Ayers and P. Rupp (*Jour. Bact., 5 (1920), No. 1, pp. 89–98*).—Some of the ways in which extracts from dry yeast have been used in bacteriological work in the research laboratories of the Dairy Division, U. S. Department of Agriculture, are described briefly. These include the use of fresh yeast extracts for replacing meat extract in the preparation of peptone broths, and of autolyzed yeast extracts as media for fermentation tests and for the growth of pathogenic types of streptococci which do not grow in other sugar-free media. Extracts of yeast digested with hydrochloric acid or with pepsin are thought to offer possibilities in many lines of bacteriological work where the presence of fermentable material is not undesirable.

Biochemistry of the acetone and butyl alcohol fermentation of starch by Bacillus granulobacter pectinovorum, H. B. Speakman (*Jour. Biol. Chem., 41 (1920), No. 3, pp. 319–343, figs. 4*).—This is a study of the intermediate changes taking place during the fermentation of starch by *B. granulobacter pectinovorum* with the final production of acetone and butyl alcohol as previously noted (E. S. R., 41, p. 415). From the results obtained in the investigation, the details of which are presented and described, the chemical changes taking place during the fermentation are summarized as follows:

"*B. granulobacter pectinovorum* growing in a medium rich in starch changes the latter into glucose by exoenzym activity. Glucose passes into the cell and is oxidized to acetic and butyric acids. These acids are in part reduced to the corresponding alcohols."

Fermentation of fructose by Lactobacillus pentoaceticus n. sp., W. H. Peterson and E. B. Fred (*Jour. Biol. Chem., 41 (1920), No. 3, pp. 431–450, figs. 2*).—The authors have continued their study of the pentose-fermenting bacteria (*L. pentoaceticus* n. sp.) found in silage (E. S. R., 42, p. 502) by an investigation of the fermentation of fructose by these organisms with particular reference to their ability to form mannitol. On the basis of the experimental data reported and those of other investigators, the general line of reaction by which fructose is broken down and mannitol is formed is thought to be as follows:

Some of the fructose is first hydrolyzed to acetic and malic acids with the production also of hydrogen. This in turn reacts with more of the fructose to form mannitol, while some of the malic acid formed in the first reaction breaks down into lactic acid and carbon dioxid. If the fructose solution is allowed to ferment for a long time, the manitol formed undergoes slow fermentation with the production of acetic and lactic acids. Some evidence was also obtained indicating that in a prolonged fermentation lactic acid itself may be broken down to acetic acid by the pentose-fermenting bacteria. The conversion of fructose into mannitol is much more rapid than the breaking up of mannitol into acetic and lactic acids, as shown by the fact that in the early stages of the fermentation mannitol accumulates to the extent of from 30 to 40 per cent of the original fructose but is eventually entirely destroyed.

Some aspects of the behavior of charcoal with respect to chlorin, G. S. Bohart and E. Q. Adams (*Jour. Amer. Chem. Soc., 42 (1920), No. 3, pp. 523–548, figs. 16*).—A study is reported from the Bureau of Chemistry, U. S. Department of Agriculture, on the absorption of chlorin by charcoal as affected by variations of temperature, the velocity of gases through the charcoal, the thickness of the charcoal, and the gas pressure on the surface of the charcoal.

The De Roode-perchloric acid method for determining potash, T. E. Keitt (*Jour. Indus. and Engin. Chem., 12 (1920), No. 3, pp. 276, 277*).—The author, at the Georgia Experiment Station, presents a preliminary report of the use of perchloric acid as a substitute for potassium platinic chlorid in the modified De Roode method for the determination of potash previously described by Keitt and Shiver (E. S. R., 42, p. 109). The technique of the procedure, which it is hoped will be tested by other workers, is as follows:

"Place 2.5 gm. of the sample on a 12.5 cm. filter paper and wash successively with portions of boiling water into a 250 cc. flask until the washings amount to about 200 cc. Acidify the solution with 5 cc. of concentrated HCl while hot, precipitate the sulphates by adding drop by drop, in slight excess, normal $BaCl_2$ solution acidified with HCl (10 cc. usually suffices). Cool, make to mark, and shake. Allow the precipitate to settle. Transfer a 50 cc. aliquot part, corresponding to 0.5 gm., to a 175 cc. porcelain evaporating dish, add 30 cc. of aqua regia, and evaporate to dryness on hot plate; add a second portion of 30 cc. of aqua regia and evaporate to dryness; then add about 10 cc. of concentrated HCl and 20 cc. of distilled water and evaporate to dryness.

"Dissolve in 20 cc. of hot water and add 5 cc. of perchloric acid, 1.12 sp. gr.; evaporate on hot plate or steam bath until copious fumes come off, remove and run the liquid around the bottom of the dish, and if it does not solidify on cooling, evaporate more and cool again. It can be rapidly cooled by floating the dish on cold water. Take up the residue with 5 cc. of cold water and add a second portion of 5 cc. of perchloric acid; evaporate the solution until dense fumes of perchloric acid appear. In case the residue appears baked, repeat the last operation.

"After cooling, add 20 cc. of 95 per cent alcohol, stir, and allow to stand 30 minutes. The precipitate may be collected either on a Gooch crucible carrying a pad of asbestos ⅛ in. thick or on a tared filter paper. When the latter is used, a good quality 7 cm. filter suffices. The collection of the precipitate on a tared filter is generally more rapid. In either case wash the precipitate twice with 95 per cent alcohol containing 0.2 per cent perchloric acid, transfer the precipitate using the same wash, and wash until the filtrate and washings amount to about 75 cc. Finally, wash twice with alcohol-ether (1:1), using 3 to 5 cc. each time, to remove all of the perchloric acid. Dry for 30 minutes at 120° C.

"Weigh and dissolve the potassium perchlorate from the Gooch with about 200 cc. of hot water. Use another receiver and wash the pad with alcohol or ether to facilitate drying, dry 30 minutes, and weigh. The loss is potassium perchlorate, and potassium oxid is calculated using factor 0.34. Where the tared paper is used, no reweighing is necessary."

A table is given of the comparative results obtained on 7 samples analyzed for potash by the Lindo-Gladding, De Roode, and the proposed De Roode-perchloric acid methods. The results by the new method were with one or two exceptions slightly lower than by the De Roode, and higher than by the Lindo-Gladding method.

The determination of calcium and magnesium in different saline media, E. Canals (*Bul. Soc. Chim. France, 4. ser., 23 (1918), No. 10, pp. 422–430; 25 (1919), Nos. 2, pp. 90–94; 12, pp. 655–658*).—A critical study is reported of the degree of precision of various methods for the quantitative determination of calcium and magnesium in saline media.

The method for calcium recommended as furnishing the greatest precision is its precipitation as oxalate and calculation either as $CaCO_3$ or CaO, although with certain precautions the determination as $CaSO_4$ is considered to be satisfactory. If the calcium is precipitated as $CaCO_3$ the subsequent oxidation to CaO is advised.

For magnesium the author recommends its precipitation as magnesium ammonium phosphate and calculation as pyrophosphate, or its volumetric determination by dissolving the precipitated magnesium ammonium phosphate in HCl and estimating the ammonia colorimetrically with Nessler's solution.

Contribution to the determination of zinc in organic materials—urine, feces, foods, etc.—with remarks on the zinc content of reagents and apparatus, A. Weitzel (*Arb. Reichsgsndhtsamt., 51 (1919), No. 3, pp. 476–493*).—Two methods of determining the presence of zinc in small amounts in organic and other materials were examined, (1) its precipitation from acid solutions of the ash of the material by means of potassium ferrocyanid, and (2) its precipitation as sulphid after treatment of the ash solution with sodium hydroxid and acetic acid. In both methods the zinc is finally converted into the oxid and determined as such.

Both wet and dry methods of oxidizing the original material were found to give equally satisfactory results, and no difference was noted in the accuracy of the final results with either of the above methods of precipitation. The second method is, however, recommended in preference to the potassium ferrocyanid method as being more rapid and requiring fewer reagents.

It was found that zinc-containing apparatus such as Jena glass could be used with safety in zinc determinations except in the presence of phosphoric acid or fluorids, both of which brought about an appreciable solution of the zinc from the glass. The necessity is consequently pointed out of using zinc-free glassware in the determination of zinc in organic materials likely to contain phosphates or fluorids.

A simple, rapid method for the determination of halogen in organic substances, W. A. VAN WINKLE and G. McP. SMITH (*Jour. Amer. Chem. Soc., 42* (*1920*), *No. 3, pp. 333–347, figs. 3*).—The method described is said to be applicable to the determination of chlorin, bromin, or iodin in volatile substances. The material, volatilized with air, is drawn through a heated quartz tube, the combustion products are absorbed in alkaline sodium sulphite solution, the excess of sulphite is oxidized, and the halogen is finally determined by the Volhard volumetric method. The method is said to be simple, rapid, and accurate and, with certain modifications, to be equally applicable to nonvolatile organic materials.

A modification of the apparatus for the determination of arginin nitrogen by Van Slyke's method, G. E. HOLM (*Jour. Amer. Chem. Soc., 42* (*1920*), *No. 3, pp. 611, 612, fig. 1*).—The essential feature of the apparatus, which has been devised at the Minnesota Experiment Station, is a straight piece of glass tubing 10 cm. in length and 3.3 cm. in diameter in which the stem of the Kjeldahl trap is fitted by means of rubber stoppers, which also contain inlet and outlet tubes for water. The tube thus serves as a condenser for the vapors passing up into the trap from the Kjeldahl flask to which it is attached. The neck of the flask is cut off to a length of about 10 cm. so that the apparatus may be used in the ordinary Kjeldahl rack. To eliminate the necessity of opening the flask when the water is added before the final distillation of ammonia, a separatory funnel is also inserted in the stopper of the flask.

In using the apparatus a stream of water is sent through the condenser during the six hours' digestion with potassium hydroxid, after which the condenser is drained and the system allowed to cool before the final distillation takes place. The advantages of the apparatus are said to be that there is no danger of loss through bumping, no transfer of material is necessary, and the expensive Folin bulb is eliminated.

The determination of small amounts of nitrites, particularly in corned beef, F. AUERBACH and G. RIESS (*Arb. Reichsgsndhtsamt., 51* (*1919*), *No. 3, pp. 532–555*).—An investigation of possible methods of determining nitrites when present in small amounts in meat was undertaken on account of the fact that the addition of nitrous acid or nitrites to meat as preservatives was forbidden by law in Germany. The possible reduction of nitrates to nitrites in meat cured with saltpeter was also investigated.

It was found that errors in the colorimetric determination of nitrates by *m*-phenylenediamin could be avoided by the addition of sodium acetate and acetic acid, and that the interfering soluble proteins and colored substances in the extracted meat samples could be removed by precipitation with a colloidal iron hydroxid solution. By following these precautions, the technique for which is described in detail, it was found possible to recover 95 per cent of added nitrites in meat samples.

An examination for nitrites of meat cured with known amounts of saltpeter showed that there was no appreciable reduction of nitrates to nitrites on standing. Synthetic sodium nitrate was found to contain as a rule less than 0.5 per cent of sodium nitrite.

In conclusion, the authors state that cured meat which is found to contain more than 15 mg. of sodium nitrite to 100 gm. of the meat must be considered to have been treated with nitrites.

Determination of magnesium in blood, W. DENIS (*Jour. Biol. Chem., 41 (1920), No. 3, pp. 363–365*).—A method of determining magnesium in small amounts of blood plasma is described, which consists essentially in the precipitation of the calcium in the plasma by Lyman's method (E. S. R., 37, p. 207), the removal of organic matter from the filtrate by oxidation with sulphuric acid, the precipitation of magnesium as magnesium ammonium phosphate, and the nephelometric determination of the phosphate by the reagent of Pouget and Chouchak (E. S. R., 20, p. 703).

The procedure, as carried out by the technique which is described in detail, has given an average magnesium recovery of 94 per cent in pure solutions containing from 0.02 to 0.1 mg. of magnesium. In more than 100 determinations on blood serum in both normal and pathological cases, the magnesium has varied from 0.8 to 3.8 mg. per 100 cc. of plasma. Excluding the pathological material, values from 1.6 to 3.5 mg. have been obtained.

Determination of chlorids in whole blood, J. H. AUSTIN and D. D. VAN SLYKE (*Jour. Biol. Chem., 41 (1920), No. 3, pp. 345–348*).—An investigation of the applicability of the Van Slyke-Donleavy method for plasma chlorids (E. S. R., 40, p. 714) to the determination of the chlorid content of whole blood is reported.

It was found that the direct application of the method to whole blood gives readings too high by 30 or 40 per cent, owing to the property of binding silver possessed by some component of the laked cells other than the chlorid, but that by precipitating the protein with picric acid alone or with picric and nitric acids after laking, and then treating the protein-free filtrate with silver nitrate and conducting the titration as in the Van Slyke-Donleavy method, accurate results may be obtained. The technique of the modification is described in detail.

A system of blood analysis.—I, A simplified and improved method for determination of sugar, O. FOLIN and H. WU (*Jour. Biol. Chem., 41 (1920), No. 3, pp. 367–374, fig. 1*).—Certain modifications have been made in the method of determining sugar in blood described in the system of blood analysis previously noted (E. S. R., 41, p. 13).

In the modified procedure reoxidations of the cuprous compounds, found to be a source of error when tubes of varying sizes are used, are excluded by the adoption of blood sugar tubes of definite size and shape, the specifications for which are given. The blank due to the blue alkaline copper tartrate is eliminated, and the error due to the so-called phenols in blood filtrates is removed by replacing the regular phenol reagent of Folin and Denis by a reagent which reacts with cuprous copper in acid solution without producing a color with phenols. The reagent is prepared by transferring to a liter beaker 35 gm. of molybdic acid and 5 gm. of sodium tungstate, and adding 200 cc. of 10 per cent sodium hydroxid and 200 cc. of water. The mixture is boiled vigorously for from 20 to 40 minutes to remove the ammonia present in the molybdic acid, cooled, diluted to about 350 cc., 125 cc. of concentrated (85 per cent) phosphoric acid added, and the whole diluted to 500 cc.

A comparison of blood sugar values per 100 cc. obtained by the original and the revised methods indicates that the new process tends to give slightly lower values than the original method.

Tables of refractive indices.—I, Essential oils, R. KANTHACK; edited by J. N. GOLDSMITH (*London: Adam Hilger, Ltd., 1918, vol. 1, pp. 151*).—In this volume, which is the first of a series of tables of the refractive indices of technical products, 1,500 measurements on over 500 distinct essential oils, compiled from various sources, are recorded. The author emphasizes in his preface the necessity of clearly stating the temperature of observation of refractive indices under all circumstances. A list of 282 references to the literature is included.

A preliminary note on some new factors affecting the hardness of gur or crude sugar, T. S. Swadi (*Agr. Jour. India, 14 (1919), No. 3, pp. 431–439*).—Preliminary data on the composition of samples of gur, and of the soils and waters in the localities growing the sugar cane from which the gur samples were prepared, are presented. From these the author draws the tentative conclusion that soil and water have an important bearing on the hardness and keeping quality of the gur, the greater the alkalinity of the soil and water the softer being the gur.

Maple sugar sand (*Jour. Agr. and Hort. [Quebec], 23 (1920), No. 9 [English Ed.], pp. 163, 164*).—Attention is called to sugar sand as a valuable by-product of the maple sugar industry, and a brief method is outlined for its preparation for market.

The sugar sand, largely composed of calcium malate, separates from the sap during its concentration to sirup, some of it depositing in the evaporator. The rest can be removed from the sirup either by settling or by filtering through flannel or felt. It is then washed with hot water to remove adhering sugar and dried on cotton or paper. If properly washed, the dry sugar sand will be powdery or lumpy and will vary in color from white to dark brown, depending upon the quality of the sirup.

[Manufacture of sorghum sirup], J. J. Willaman, R. M. West, and C. P. Bull (*Minnesota Sta. Bul. 187 (1919), pp. 32–55, figs. 8*).—The manufacture of sorghum sirup on a large scale is discussed in detail. Descriptions are given of suitable factory buildings, evaporators, filter presses, and miscellaneous equipment, and the various processes involved in the manufacture of the sirup are explained and their relative merits discussed. These include the extraction of the juice; defecation by heat, by heat and lime, and by other means; evaporation of the juice in direct fire and steam coil evaporators and vacuum pans; and clarification, cooling, and packing of the sirup.

Analyses compiled from different sources are reported of sorghum sirups from various localities and produced by various methods. These figures indicate that there is a direct relation between the amount of lime used in the defecation and the acidity of the sirup. The proportion of sucrose to dextrose in the sirup depends mainly on the maturity of the cane and the acidity during defecation and evaporation. The amount of mineral matter is proportional to the lime used. The standard density for sorghum sirup is such that there is about 75 per cent of total solids.

In discussing the economic considerations of sorghum sirup manufacture, it is shown that as a rule the small-scale manufacture is not an economic procedure, and that factories at present operating on such a basis can as a rule profitably install additional equipment. Estimates are given showing that the total cost of producing sorghum sirup per season in 1918 in mills of a capacity of 1,000, 20,000, and 70,000 gal., respectively, was about 75, 51, and 46 cents per gallon. Tables are also given for computing the amount of available sugar contained in one ton of cane by means of the Baumé hydrometer reading of the juice, and of the composition and relative values of three grades of sorghum cane.

METEOROLOGY.

Factors of climatic control, W. J. Humphreys (*Jour. Franklin Inst., 188 (1919), No. 6, pp. 775–810; 189 (1920), No. 1, pp. 63–98, pl. 1, figs. 11*).—The chief factors of climatic control enumerated in this article are latitude, brightness of moon and planets, solar "constant" at a fixed distance, solar distance, obliquity of ecliptic, perihelion phase, extent and composition of the atmosphere, vulcanism, sun spots, land elevation, land and water distribution, atmospheric circulation, ocean circulation, and surface covering. The article deals especially with the relation to climate of vulcanism, land elevation, atmospheric and ocean currents, sun spots, carbon dioxid content of the atmosphere, and surface covering.

"It appears from various considerations that, with a constant or nearly constant output of solar energy, the earth itself possesses the inherent ability to profoundly modify its own climates, whether only local or world-wide. Thus, a mere change in land elevation, whether of plateau or of mountain range, a thing that appears often to have happened, must alter both the local and the leeward climates, and, by reducing the general humidity, somewhat lower the average temperature. Besides, a change in land elevation of any considerable extent is pretty certain to be accompanied by a somewhat corresponding variation in continental area and such modification of shore lines and ocean beds that greater or less changes must follow in the directions, temperatures, and magnitudes of ocean currents, in the location and intensity of permanent 'highs' and permanent 'lows,' in the direction, force, and temperature of local winds, in the amount and kind of local precipitation, and in a host of other meteorological phenomena.

"Again, as the laws of radiation indicate must be true, and as observations, at least back to 1750, the date of the earliest reliable records, show, the temperature of the lower atmosphere depends in part upon the amount of dust in the upper air, in the sense that when this amount is great the average temperature at the surface of the earth is below normal, and when the dust is absent this temperature is comparatively high. Hence, as there appear to have been several periods of great volcanic activity in the past with intervening periods of volcanic quiescence, it is inferred that volcanic dust in the upper atmosphere was at least one important factor in some, if not all, of the great and universal climatic changes that have left their records in abandoned beaches and forsaken moraines."

It is suggested that the greatest of our past climatic changes may have been caused "by the roughly synchronous variations in continental level and volcanic activity; universal cold periods coming with increase in vulcanism, increase in elevation, and the obstruction of interzonal oceanic circulation; universal mild periods when volcanic dust seldom veiled the skies, when the continents had sunk or been eroded to low levels, and when there was great freedom of oceanic circulation from equatorial to polar regions; mild universal climatic oscillations with temporary changes in vulcanism; and mere local climatic changes with variations in such local climatic controls as near-by elevations and neighboring ocean currents. . . . It is but reasonable to suppose that the world is yet to know many another climatic change, in an irregular but well-nigh endless series, often local and usually slight, though always important, but occasionally, it may be, as in the ages gone, . . . universal, profound, and momentous."

The variability of corresponding seasons in different years, F. STUPART (*Jour. Roy. Astrom. Soc. Canada, 13 (1919), No. 6, pp. 259–263; abs. in Sci. Abs., Sect. A–Phys., 22 (1919), No. 264, p. 544*).—Discussing this subject particularly with reference to the winters of 1917–18 and 1918–19 in Canada, the former being phenomenally cold and the latter phenomenally mild, it is shown that in the first case "the North Pacific low pressure was situated much farther south than usual, and its offshoots, in the form of traveling low areas, passed into Canada over southern British Columbia and thence kept away to the southward, and the result was a prevalence of northerly winds, not only in the western provinces but also in eastern Canada." During the winter of 1918–19 "the

North Pacific low was extremely energetic and in a stream of offshoot cyclonic areas, which impinged on the northern Alaskan coast, prevented the formation of anticyclonic conditions, and passing first southeastward, finally moved eastward as dispersing areas across the western provinces, there giving most persistent gradients for southerly and southwesterly winds with unseasonably high temperature." The author suggests further investigations regarding the control of the great centers of action in the North Pacific and North Atlantic, particularly the effect of changes both in position and temperature of the great ocean currents.

The book of normals of meteorological elements for the British Isles (*Met. Off.* [*Gt. Brit.*], *Book of Normals, Sect. I, 1919, pp. 94*).—This document gives monthly and annual averages of temperature, rainfall, and sunshine for the period of 35 years, 1881–1915.

Predicting stream flow in the Sierras, J. N. LE CONTE (*Jour. Electricity, 41* (*1918*), *No. 6, pp. 248–251, figs. 21*).—Data on snowfall and also on the rate of melting of snow on the ground at Summit, Cal., at an elevation of 7,000 ft., for 20 years are reported and discussed, the purpose being to show the relation between the individual seasons and the average for the entire period.

While the results are considered rather unreliable, it is stated that "enough is brought out to show a definite law." By imposing the mean curve of snowfall for 20 years on the curves for each year probable curves of melting are deduced, which indicate that "if on the first of April the actual curve falls below the mean, the season will probably be a dry one so far as snow-fed streams are concerned. If, on the contrary, the actual curve of melting falls far above the mean, the snow will lie long in the mountains, and floods will come late."

Determination of water supply from snow fields (*Engin. News-Rec., 83* (*1919*), *No. 17, pp. 766–768, fig. 1*).—This article describes and illustrates Church's snow sampler; gives tables prepared by Church and Smith, showing the relation between depth and water content of snow, based on several years' studies and snow surveys in the Sierra Nevada Mountains in Nevada, previous accounts of which have been noted (E. S. R., 38, p. 416; 41, p. 211); and discusses the use and value of the sampler and tables in estimating in advance the amount of water available for irrigation and power purposes.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and G. S. SMITH (*Massachusetts Sta. Met. Buls. 373–374* (*1920*), *pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during January and February, 1920, are presented. The data are briefly discussed in general notes on the weather of each month.

Meteorological observations of the College of Belen, Habana, 1918, L. GANGOITI (*Observ. Met., Magnet., y Seismico Col. Belen* [*Habana, Reseña Met.*], *1918, pp. 11+*[*77*]).—Detailed daily and monthly summaries of observations on pressure, temperature, precipitation, evaporation, humidity, wind, and cloudiness are given, and the characteristic meteorological features of each month are described in notes.

British rainfall, 1918, H. R. MILL and M. DE C. S. SALTER (*London: Edward Stanford, Ltd., 1919, pp. 68+*[*242*], *pls. 4, figs. 30; abs. in Nature* [*London*], *104* (*1919*), *No. 2617, p. 411*).—This is the fifty-eighth report of the British Rainfall Organization and its last as an independent organization, the control of the work having passed to the British Meteorological Office. The report contains, as usual, tabular summaries of data recorded by about 5,000 voluntary observers. It also contains special articles on The Development of the British Rainfall Organization Since 1910, by H. R. Mill, and on The Relation of Rainfall to

Configuration, by M. de C. S. Salter, the latter of which has been noted previously (E. S. R., 41, p. 510).

Rainfall maps are given which show for each month the actual rainfall in inches and the percentage of the average. A colored map is given which shows the relation of rainfall in 1918 to the average of 1875–1909. Evaporation and percolation data from several stations are also included.

Meteorology and agriculture, T. B. FRANKLIN (*Jour. Scot. Met. Soc.. 3. ser., 18* (*1919*), *No. 36, pp. 76–83; abs. in Scot. Jour. Agr., 3* (*1920*), *No. 1, pp. 90–93*).—This paper discusses briefly and in a nontechnical way the relation of meteorological conditions to the soil supply of heat, water, and air required in plant growth, and also reports results of experiments by the author showing the action of soil mulches (surface tillage) and protection from the wind in conserving soil moisture and increasing the yield of potatoes.

SOILS—FERTILIZERS.

Soil survey of Linn County, Iowa, F. B. HOWE, T. H. BENTON, M. Y. LONGACRE, and A. H. MEYER (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 44, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station, deals with the soils of an area of 453,760 acres in east-central Iowa, which lies within the glaciated portion of the State. The topography of the greater part of the area is that of a partially eroded drift plain, a feature of which is the occurrence of lenticular hills and ridges. Apparently every part of the area is reached by tributaries and minor drainage ways.

The soils of the county are derived mainly from loess, glacial till, and alluvial deposits. The glacial soils occupy the largest area. Including muck, 27 soil types of 12 series are mapped, of which the Carrington silt loam covers 49.7 per cent and the Carrington loam 10 per cent of the area.

Agricultural study of the soils of Cochin China, P. BUSSY (*Bul. Agr. Inst. Sci. Saigon* [*Cochin China*], *2* (*1920*), *No. 1, pp. 1–11*).—The soils of Cochin China are divided into soils of recent alluvial origin, soils of ancient alluvial origin, and red soils of volcanic origin. Physical and chemical analyses of the different phases of each division are reported and discussed.

The soils of recent alluvial origin are generally very fertile, but require cultivation with high-powered machinery during a time of the year when the moisture content is at the optimum. They respond particularly to additions of phosphatic and calcareous fertilizers. The most recent alluvial deposits contain a considerable proportion of clay, which is thought to explain the great tenacity of these soils. These soils contain a considerable quantity of humus and an important reserve of organic matter, and are well supplied with nitrogen. It is noted that both the soil and the subsoil contain more magnesium than lime.

The older alluvial soils have about the same characteristics as those of more recent origin, except that the proportion of clay is somewhat lower. The soils of recent alluvial origin also contain certain areas of a highly acid nature, due to the presence of the sulphates of iron and aluminum. The valley alluvial soils are characterized by considerable gravel and mixtures of sand and organic débris. These soils are generally easy to cultivate.

The soils of ancient alluvial origin are easy to cultivate, but require abundant applications of fertilizers, particularly stable manure and other materials to increase the humus content. Additions of phosphatic and potassic fertilizers are also considered advisable. These soils are very permeable and are usually siliceous clays. They are generally deficient in fertilizing constituents.

The red soils are siliceous clays to their total depth, with the clay fraction predominating. They have a high capacity for retaining moisture, and contain a varying proportion of siliceous and strongly ferruginous gravel. The red soils are generally deficient in potash and lime, and are generally well supplied with nitrogen and phosphoric acid. When properly treated it is considered possible to conduct general agriculture in the red soils.

The movement of moisture in soil by capillarity, W. Gardner (*Soil Sci.*, 7 *(1919), No. 4, pp. 313–317, figs. 3*).—In a contribution from the Utah Experiment Station, the author presents a mathematical analysis of the subject to show that the density or mass of moisture per unit volume in soil may be expressed in the formula $p=(Ax+B)^{2/3}$. In this p is the density, A and B are integration constants, and x apparently denotes distribution.

In the station laboratory several preliminary observations were made as to the moisture distribution at the steady state. The moisture was allowed to penetrate by capillarity into horizontal tubes of about 4 cm. diameter containing fine sand, and was evaporated from the remote end. The tubes, about 6 ft. in length, were mounted in such a way as to rotate about an axis perpendicular to the tube, and a record of the changing moment due to the moisture as it crept forward was kept as a guide to the degree to which a steady state was approached. The results are graphically reported, and it is the opinion that the assumptions which have been made in the theoretical considerations may affect the magnitude of the exponent in the equation, but the experimental data would seem to indicate that the equation is not far from correct. The experimental errors were rather large, owing to the fact that slight irregularities in the manner of packing the soil and other attendant experimental difficulties tended to modify the results obtained.

Three references to literature bearing on the subject are appended.

Adsorption phenomena in soils, D. J. Hissink (*Chem. Weekbl., 16 (1919), No. 35, pp. 1128–1146; abs. in Chem. Abs., 13 (1919), No. 23, p. 3266; Jour. Soc. Chem. Indus., 38 (1919), No. 23, p. 918A*).—The author calls attention to what he considers to be the erroneous interpretation of experiments by others, notably those of Van Bemmelen, on the relative adsorptive power of different soils for the cations sodium, ammonium, potassium, calcium, and magnesium. It is believed that the amount of a cation adsorbed from a solution depends on the amount already adsorbed in the soil, and that in order to ascertain the relative adsorption affinities of cations it is necessary to treat soil containing only one adsorbed cation with solutions of the others.

Experiments with clay containing only ammonium as the adsorbed cation gave the following descending order of adsorptive affinity: Magnesium, calcium, ammonium, potassium, and sodium. From experiments with permutit it is concluded that the ferric ion is not contained in it in such a way that it can enter into adsorption equilibrium with other cations in solution.

Disinfection of soil, E. Miège (*Prog. Agr. et Vitic.* (*Ed. l'Est-Centre*), *41 (1920), No. 6, pp. 133–140*).—A review is given of the work of others bearing on the subject, and the results of two series of experiments are reported. Field and garden experiments were conducted on a heavy siliceous clay soil at the National School of Agriculture at Rennes. The crops were potatoes, buckwheat, tomatoes, carrots, beans, and leeks. Several different substances, including sulphur, copper sulphate, potassium permanganate, calcium hypochlorite, charcoal, toluene, formal, lysol, carbon disulphid, and oxygenated water, were used.

In the field the action of the different substances was clearly manifest. Potatoes matured earlier and the quality was improved. Sulphur gave the best results, and copper sulphate showed some increase in yield. Toluene also gave good results. Calcium hypochlorite gave the best results with buckwheat.

In the garden experiments the materials added gave good results with all the crops, not only in increased yields but also by improvement in quality and condition. The bean crop was increased 120 per cent with calcium hypochlorite and 70 per cent by a simple application of charcoal. The yield of tomatoes was increased 45 per cent by the use of antiseptics and the carrot crop 200 per cent, the quality of the latter being also considerably improved. The use of antiseptics was markedly effective in protecting the crops against parasites.

Greenhouse and plat experiments with tomatoes, cucumbers, and carnations, on a clay soil rich in iron oxid and deficient in lime, are also reported. The best results in these experiments were apparently obtained with toluene and carbon disulphid. It is noted that different results were obtained with different materials added, the specific result depending upon the chemical composition of the material and the species of plant on which it was used. For instance, in a comparison of the two sets of experiments it is noted that sulphur and copper sulphate gave better average results on potatoes and tomatoes than on any of the other crops, and lysol and formol gave better results on carrots. Tomatoes were benefited more by toluene and carbon bisulphid than by any other material. The use of lysol and formol together diminished their effectiveness, while the addition of calcium hypochlorite and charcoal to sulphur increased its effectiveness.

Attention is drawn to the difficulty of distinguishing between the fertilizing action of the materials used and their antiparasitic action, and it is concluded that more research is necessary to place soil sterilization on a practical working basis.

The disinfection of soil and its partial sterilization, L. Malpeaux (*Vie Agr. et Rurale, [10] (1920), No. 6, pp. 94–97, figs. 3*).—A review is given of a number of experiments by others on the partial sterilization of soils, with particular reference to the use of sulphur compounds.

Research on soil reaction, E. Rabaté (*Prog. Agr. et Vitic. (Ed. l'Est-Centre), 41 (1920), No. 7, pp. 161–165*).—Different methods of determining and studying soil reaction are reviewed, and the interpretation of the results of such studies from the soil fertility standpoint is discussed. The use of organic nitrogenous fertilizers is advised on strongly basic soils, and it is stated that numerous tests have shown that soils of acid reaction are almost always deficient in available phosphoric acid. Natural phosphates are recommended for such soils and superphosphate for strongly alkaline soils. It is concluded that a study of soil reaction should always be conducted in soil surveys, and that data regarding reaction should always accompany soil analyses.

A study of methods of determining soil alkali, D. W. Pittman (*Utah Sta. Bul. 170 (1919), pp. 3–21, figs. 8*).—This bulletin reports comparisons of different methods of testing alkali soils, both as to results and relative variability, a study of some of the irregularities in the water extraction method of testing for sodium carbonate, and a study of crop germination as an indication of alkalinity.

It was found that the many different methods of determining and expressing the alkali content of a soil give widely varying results, especially with reference to the sodium carbonate content. The amount of basic carbonate determined in a soil by water extraction was found to vary with the organic content of the soil, the time allowed for equilibrium, and the proportion of soil to water used.

Studies of the absorption of sodium carbonate by synthetic soils showed a large but widely varying absorption of the carbonate which was in general, however, proportional to the organic matter content of the soil. The stage of equilibrium was also very largely dependent on the amount of water used, and extraction was relatively less where a small amount of the salt was added originally.

The toxic limits of alkali salts in a soil were found to differ with the different methods of determining the salt in the soil. Data are given showing the degree of toxicity of the three most important alkali salts—sodium chlorid, sodium carbonate, and sodium sulphate—as indicated by germinating wheat kernels in soils to which these salts were added in different amounts. Graphic data are also given showing the relationship between the toxicity of these salts and different methods of determining the salt content of soil.

The tolerable limits of the contamination of the Weser River water by wastes from the potash industry, KERP (*Arb. Reichsgsndhtsamt., 51 (1919), No. 2, pp. 239–389*).—A rather extensive study of the contamination of the water of the Weser River in Germany from the waste products of potash industries is reported.

It was found that fish life was not materially injured until a hardness degree of 110 was reached in a concentration of chlorin of 2,000 mg. per liter. The injury to agricultural lands overflowed by the river waters, while not very marked, was found to be mainly due to the influence of the potash by-products on the physical condition of the soil. It is concluded, however, that the potash industry should continue to take steps toward the safe disposal of the waste products without permitting them to flow into the river water, and extensive recommendations as to the permissible limits governing such practice and methods of disposal are given.

The doctrine of fertilizers, E. PFYFFER VON ALTISHOFEN (*Die Düngerlehre. Berlin: Hugo Steinitz, 1917, 2. ed., pp. IX+292, figs. 106*).—This is a text-book giving information on fertilizers and fertilizing materials, and their rational use in German agriculture. It is the purpose to cover all types of different fertilizers and soil amendments, including natural and artificial complete fertilizers, green manures, and general commercial fertilizers.

The determination of the fertilizer requirements of soils, E. HASELHOFF (*Fühling's Landw. Ztg., 67 (1918), No. 11–12, pp. 193–204*).—A summary is given of studies bearing on the subject by a number of different experimenters, from which the conclusion is drawn that plant analysis may assist in determining the fertilizer requirements of soils, but that it is not an absolutely certain basis for such determination. The results of long-time pot experiments are considered to be a better basis, especially when all growth factors, particularly moisture content, are considered.

In this connection experiments with rye, beans, wheat, beets, and oats, on three different soils, extending over a period of five years, are reported, the purpose being to show the variations in results which may occur under variable conditions. Several different schemes of fertilization were employed, and a large variation in yield of crops was noted. Variations in yield were noted with individual fertilizers in the same year, from which it is concluded that the application of such experimental data to other soils is not feasible. The results are also taken to indicate the vast possibilities for error in 1-year experiments. It is concluded that fertilizer experiments can give a correct indication of the fertilizer requirements of the soil when the experiments are conducted for several years with different crops under conditions of soil, weather, and other factors which are of particular significance to a particular crop.

The influence of two different fertilizers on plant yield, E. A. MITSCHERLICH (*Landw. Jahrb., 52 (1918), No. 2, pp. 279–296, pls. 3, fig. 1; abs. in Chem. Zentbl., 1918, II, No. 19–20, pp. 854–856*).—Experiments are reported on the influence on the yield of oats of two fertilizers which had no influence on each other. Potash was used as potassium sulphate and nitrogen as ammonium nitrate. It was found, when both fertilizers were present in the same available form and were not influenced by any other substances, that to obtain the highest yield of oats 2.18 times as much nitrogen was necessary as potash, indicating that the potash was better utilized by the plant than the nitrogen. This experiment again confirmed the correctness of the law of physiological relations, and the author is of the opinion that the Baule formula is practical, since it was mathematically possible to express the crop yield in terms of the many variables.

A second experiment on the influence of two fertilizers having an influence upon each other is reported. In the first part of the experiment, calcium carbonate was used in connection with phosphatic fertilizers. Raw phosphate did not give so high results with reference to crop yield as a more soluble fertilizer. It was also found that the highest yield which could be obtained with phosphatic fertilization was depreciated by the addition of calcium carbonate, gradually at first and later more rapidly. It is concluded, on the basis of an experiment with a phosphorite meal, that an increased yield through phosphatic fertilization with calcium carbonate is almost impossible. The value of Thomas meal, however, was considerably greater than that of tricalcium phosphate in the presence of calcium carbonate. It is further concluded that phosphoric acid fertilization on soil recently treated with lime or marl is ineffective, and also that it is ineffective on soils rich in lime unless the injurious action of the lime is counteracted by other salts, such as ammonium sulphate.

In the second part of this experiment, potash and ammonium chlorid were used together. It was found that the ammonium chlorid depreciated the action of the potash, and it was considered probable that the ammonium chlorid under the given conditions was physiologically acid and had a poisonous effect.

Some factors which influence the yield of paddy in comparative manurial experiments at the Manganallur Agricultural Station, H. C. Sampson (*Agr. Jour. India, 14 (1919), No. 5, pp. 739–746*).—A review of these factors is given, which indicates the importance of maintaining careful notes of experiments and the danger which lies in merely judging the results of different plats by the figures of yields recorded.

Long-time fertilizer experiments on the same soil, from 1905 to 1918, F. von Lochow (*Fühling's Landw. Ztg., 67 (1918), No. 23–24, pp. 442–448*).—Cropping experiments, using complete and individual fertilizers on a loamy sand soil with a loamy sand to a sandy loam subsoil, are reported, extending from 1905 to 1918, inclusive. It is concluded from the results of these experiments that long-time experiments on the same soil, using fertilizers in general, are not productive of profitable information, and that better results can be obained by conducting experiments to determine what particular fertilizers can be most profitably used on a particular soil.

Manuring for milk, J. M. Adams (*Dept. Agr. and Tech. Instr. Ireland Jour., 20 (1919), No. 1, pp. 45–61, figs. 2*).—Experiments extending over several years, conducted at the Clonakilty Agricultural School in Ireland, in which cows were tested on manured and unmanured pastures, are reported.

The experiment consisted in the estimation of the improvement in pasture following the application of basic slag and other fertilizers, in terms of milk yield, the results being obtained by grazing milch cows and comparing the yield of milk produced with that of similar cows grazed on an equal area of the same pasture unmanured. The results of these experiments demonstrated that manuring for milk is profitable, and that the carrying capacity for cows of a poor pasture can be considerably increased by manuring. It was found that on the poor pastures tested it was possible for cows in milk to more than pay the cost of the basic slag in the first season after application by reason of the greater number of cows carried. Particular attention is drawn to the fact that the advantage gained by manuring poor pastures lies not so much in the individual increase in milk yield per cow as in the additional carrying capacity of the pasture.

Investigations on the conservation of liquid manure by the addition of different materials, O. LEMMERMANN and H. WIESSMANN (*Landw. Jahrb., 52 (1918), No. 3, pp. 297–341*).—Investigations on the conservation of liquid manure by the addition of different materials, especially brown coal, peat, sulphuric acid, sodium bisulphate, superphosphate, kainit, gypsum, and formalin, are reported.

The brown coal used was able to combine with 5.122 per cent of ammonia. The compound formed was very stable at ordinary temperatures, but released a part of the ammonia at 100° C. The addition of from 50 to 60 per cent of air-dry brown coal containing 80 per cent dry matter was sufficient to preserve perfectly the liquid manure used. Fertilizer experiments with liquid manure conserved with brown coal gave good results, and the nitrogen in the so-treated liquid manure was more active than an equal amount of nitrogen in the form of ammonium sulphate. The addition of 20 per cent of peat to liquid manure resulted in a loss of 51.03 per cent of the nitrogen after 62 days, in spite of the fact that the peat possessed the power to form a very stable chemical compound with ammonia.

The addition of from 1.5 to 2 per cent of sulphuric acid of 66° B. protected liquid manure from nitrogen losses. The addition of 7 per cent sodium bisulphate of an acidity equivalent to 0.3501 gm. of sulphuric acid per gram of the substance was sufficient to conserve the liquid manure used. The nitrogen loss after 62 days, by the addition of 10 per cent superphosphate, was 27.48 per cent. The use of kainit did not conserve liquid manure. An addition of 15 per cent resulted in a loss of 70.18 per cent of the nitrogen within 62 days. Gypsum gave somewhat better results than kainit, although by an equal addition the nitrogen loss was 63.86 per cent within 62 days. The addition of 0.25 per cent of formalin to fresh urine depressed fermentation of the urea. An addition of 6 per cent formalin to liquid manure was equally effective and the nitrogen loss after 62 days was only 1.7 per cent. Experiments with numerous other materials showed that small quantities of zinc chlorid and copper sulphate sufficed to prevent urea fermentation, while other salts, such as sodium chlorid and sodium sulphate, when used in the same quantities, were unable to do so. It was found that in studies on the conservation of liquid manure it is of the greatest importance to know the exact characteristics of the liquid manure used.

Fertilizer mixtures and composts, G. R. P. D'UTRA (*Estrumes Mixtos e "Compostos." Sao Paulo: Sec. Agr., Com. e Obras Pub. Estado Sao Paulo, 1919, pp. 103*).—This pamphlet summarizes considerable data from different sources on the preparation and use of barnyard manures and composts in agriculture, with particular reference to the application of the methods outlined to conditions in Brazil. Special attention is given to the composition of different barnyard manures and composts, the conservation of such manures, and the amounts to be used on different soils for different crops.

Artificial nitrogenous fertilizers, E. J. RUSSELL (*Jour. Soc. Chem. Indus., 39 (1920), No. 1, pp. 5R, 6R*).—Experiments on the value of ammonium nitrate, calcium nitrate, and cyanamid as sources of nitrogen, as compared with other well known nitrogenous fertilizers, are reviewed.

It is noted that in most cases ammonium nitrate gave better results than either sodium nitrate or ammonium sulphate when used in amounts giving equal amounts of nitrogen. "On the other hand, nitrate of ammonia has some disadvantages in comparison with nitrate of soda; it is not so easily handled by the farmer, it has to be stored in casks, not in bags, and it is not readily applied by the ordinary drill. These are essentially minor disadvantages, but they offset any slight advantage the nitrate of ammonia may possess over nitrate of soda."

A comparison of calcium nitrate with sodium nitrate indicates no important difference. "Nitrate of lime has the advantage that the calcium is never hurtful in the soil, while the sodium sometimes is, though also the sodium is sometimes an advantage."

It is stated that the whole value of cyanamid depends upon the rate at which ammonia is formed, this depending largely upon the soil to which it is added. "There is reason to suppose that the production of ammonia takes place in two stages, the first of which is purely chemical and the second bacterial; further, that the agent producing the chemical change is not always present in sufficient quantity in the soil. It would be an obvious advantage if a chemist could say beforehand of a given class of soil whether or not it were likely to decompose cyanamid. Work with this purpose has been carried out at Rothamsted, and the results are very promising.

"The results of all published field trials show that the three fertilizers—nitrate of soda, sulphate of ammonia, and cyanamid—when compared on the basis of equal nitrogen content have the following values: Nitric nitrogen 100, ammonical nitrogen 97, cynanamid nitrogen 90. But these include cases where the cyanamid nitrogen could have had no proper chance of acting. Under better advice, the farmer could have been warned beforehand and the use of the cyanamid kept to those numerous cases where it can decompose rapidly and act well. In these circumstances the value of the cyanamid nitrogen might rise well above 90, and, what is more important, the risk of failure might be considerably reduced."

Some aspects of cheap cyanid processes, H. Philipp (*Chem. and Metal. Engin., 22 (1920), No. 7, pp. 313–317*).—A review is given of the developments in cyanid synthesis and improvements made in the ferrocyanid processes. A discussion is given of reactions between nitrogen, carbon, and the alkaline bases, nitrogen fixation by the electric arc, and the cyanamid process. It is stated that the disadvantages offered by the Bucher process are the number of steps involved, the short life of the retorts, the inability to use the finely divided iron many times owing to the accumulation of impurities, and the difficulty and losses in separating the sodium cyanid from the aqueous solution.

The synthesis of ammonia, I–III, E. B. Maxted (*Chem. Age [London], 1 (1919), Nos. 19, pp. 514, 515; 20, pp. 540–542; 22, pp. 590–592, fig. 1*).—This paper is in three parts.

Part I deals with the present position of ammonia synthesis in Great Britain. The author draws attention to the vague nature of the international position with regard to the Badische patents, and states that the possibility of having to defend an action for infringement may have prevented the erection of synthetic plants in Great Britain. Part II deals with the technology of the process of ammonia synthesis. Part III takes up the relation between the direct synthesis of ammonia and the alternative methods of nitrogen fixation from an economic standpoint, with special reference to their applicability in Great Britain.

The advantages of the synthesis of ammonia under very high pressures, G. Claude (*Compt. Rend. Acad. Sci. [Paris], 170 (1920), No. 3, pp. 174–177*).—In a discussion of the German process of ammonia synthesis using pressures around 200 atmospheres, it is pointed out that the use of pressures around

1,000 atmospheres has the advantage that the combination of the ammonia is hastened and the catalyzer may be reduced in size, even in excess of an inverse ratio to the pressure. The recovery of the ammonia is facilitated also, and by use of cooling water it may be recovered as liquid ammonia with high pressures without the necessity of recovering it as an aqueous solution.

Reversible oxidation of sodium nitrite, C. Matignon and E. Monnet (*Compt. Rend. Acad. Sci. [Paris], 170 (1920), No. 3, pp. 180–182*).—Experiments are reported from which it is concluded that the passage of sodium nitrite to sodium nitrate by direct oxidation is a reversible reaction that requires a good catalyzer which will permit active operation under atmospheric or reduced pressures.

Phosphate demonstrations in Stevens County in 1918, P. R. McMiller, P. E. Miller, and G. H. Nesom (*Minnesota Sta., Rpt. Morris Substa., 1918, pp. 47–54, figs. 2*).—This has already been noted from another source (E. S. R., 41, p. 425).

The potash of Alsace and potash of Germany, A. Arnal (*Vie Agr. et Rurale, [10] (1920), No. 6, pp. 98–100*).—A comparison is given of the value of the potash resources of Alsace and of Germany. It is the opinion that the German potash is inferior in grade and purity to that of Alsatian potash, and that the process of extraction is more difficult. Other factors of advantage of the Alsatian potash are discussed.

Sources of industrial potash in Western Australia, E. S. Simpson (*West. Aust. Geol. Survey Bul. 77 (1919), pp. 46, pls. 2, figs. 4*).—This report deals with the sources of industrial potash in Western Australia and includes descriptions of the uses, manufacture, foreign supplies, and local occurrences throughout the State as far as they have been examined. The local sources of potash in Western Australia are wood, seaweed, and coal ashes; feldspar; glauconite; jarosite; and alunite. Chemical analyses of samples of these materials are reported and discussed, with a view to local development.

Two appendixes, on Examination of Western Australian Seaweeds for Potash and Iodin, by I. H. Boas; and The Alunite Deposits at Kanowna, by T. Blatchford, are also included.

The practice of liming, P. Diffloth (*Vie Agr. et Rurale, [10] (1920), No. 6, pp. 89–93, figs. 3*).—A summary is given of French practice in liming agricultural soils, in which different types of lime used and the action of lime in soils are discussed. Lime spreading and the burning of lime are also described.

The rôle and use of magnesium in fertilizers, J. Lefèvre (*Vie Agr. et Rurale, [10] (1920), No. 6, pp. 105–107*).—A review of the results of different experiments on the value of magnesium as an element in fertilizers is given. Analyses of different crops are given showing an appreciable percentage of magnesium. It is the opinion that the use of magnesium in the form of dolomite is advisable, particularly for viticulture.

Limekiln gases for carbon dioxid fertilization, F. Riedel (*Tonindus. Ztg., 43 [1919], pp. 607–610, 619, 620; abs. in Chem. Zentbl., 1919, III, No. 18, p. 737*).—Experiments are reported indicating that successful results in promoting crop growth were obtained in hothouses through the use of carbon dioxid gas obtained from a limekiln. It was found that the yield was in some cases doubled and in others quadrupled, and these results are attributed to the use of the gas.

Increasing the production of irrigated wheat and jowar (*Dept. Agr. Bombay Leaflet 6 (1918), pp. 2*).—Brief data are given to show the increase in yield of irrigated wheat and sorghum resulting from the use of oil cakes as manure on Bombay soils.

Progress of the inorganic chemical industries in the principal provinces [of Germany] during 1917, V. Hölbling (*Chem. Indus.* [*Berlin*], *41* (*1918*), *Nos. 17–18, pp. 177–188; 19–20, pp. 202–215*).—This is a summary of reports of progress along inorganic chemical lines in Germany during 1917, including sections on sewage, sulphur, nitrogen, and nitric acid, potash, and ammonia.

Fertilizers for 1917, A. McGill (*Lab. Inland Rev. Dept. Canada Bul. 378* [*1917*], *pp. 37*).—Analyses of 349 samples of fertilizers and fertilizing materials offered for sale in Canada and collected for inspection during March, April, and May, 1917, are reported. It was found that six samples were low in phosphoric acid, four in ammonia, and one in both ammonia and phosphoric acid.

AGRICULTURAL BOTANY.

Cooperation and individualism in scientific investigation, C. L. Shear (*Sci. Mo., 9* (*1919*), *No. 4, pp. 342–348*).—This is a brief discussion of needs and possibilities in regard to cooperation and individualism in scientific work under the conditions of the present and the probable near future.

Directions for collecting flowering plants and ferns, S. F. Blake (*U. S. Dept. Agr., Dept. Circ. 76* (*1920*), *pp. 8, figs. 3*).—This circular replaces a portion of circular 126 of the Bureau of Plant Industry (E. S. R., 29, p. 327). Instructions are given for collecting and preserving flowering plants and ferns.

Natural history of Paradise Key and the near-by Everglades of Florida, W. E. Safford (*Ann. Rpt. Smithsn. Inst., 1917, pp. 377–434, pls. 66, figs. 32*).—This is a report of a survey begun by the author in September, 1917, and resulting in the collection of specimens representing many branches of natural history (both animal and plant life), which have been deposited in different institutions which are named.

This island, situated in the heart of the Florida Everglades, is said to present a remarkable example of a subtropical jungle in which primeval conditions of animal and plant life have remained unchanged by man. It is said to be remarkable also as being the meeting place for many temperate and tropical types. Discussion is given of the climate, physical geography, and history of this and neighboring regions.

The consideration of life as regards plants includes discussion of marsh and slough plants; forest trees and their epiphytes; climbing lianas; native palms; and plants peculiar to the pineland region, especially the saw palmetto and the cycad *Zamia floridana*.

Floral aspects of the Hawaiian Islands, A. S. Hitchcock (*Ann. Rpt. Smithsn. Inst., 1917, pp. 449–462, pls. 25*).—The author, having in the summer of 1916 studied with the aid of A. E. Hitchcock the flora of this area, describes the various aspects of plant life of the Hawaiian Islands in connection with the bearings thereon of the situation, climate, and history of the Islands.

The flora of Stewart Island (New Zealand): A study in taxonomic distribution, J. C. Willis (*Ann. Bot.* [*London*], *33* (*1919*), *No. 129, pp. 23–46, figs. 2*).—The flora of Stewart Island is dealt with in the light of the age and area theory as regards its taxonomic distribution. It is claimed that all the general predictions made have proved correct.

The relationship of Stewart Island to the two great invasions of plants into New Zealand is considered. It is claimed that the northern invasion was perhaps the earlier. It is thought that Stewart Island did not lie in the track of the southern invasion, but that it received plants thereof from the northern side of Foveaux Strait. In each invasion the plants which occur in Stewart Island are selected from the largest families and genera. It is claimed that, as many predictions may be successfully based upon age and area alone, the operation of this factor must be the principal positive determining cause in geographical distribution, while the operation of barriers is the principal negative cause. Some difficulties are discussed.

Observations on the anatomy of teratological seedlings.—I, On the anatomy of some polycotylous seedlings of Cheiranthus cheiri, H. S. HOLDEN and D. BEXON (*Ann. Bot.* [*London*], *32* (*1918*), *No. 128, pp. 513–530, figs. 17*).—The authors describe the vascular anatomy of a series of seedlings of *C. cheiri*, showing cotyledonary abnormality ranging from hemitricotyly to tetracotyly. This is believed to indicate at least two methods of cotyledonary increase, namely, cotyledonary fission and dichotomy of the growing point of the cotyledon. To these may possibly be added the downward displacement of one or more epicotyledonary leaves. The relation of these facts to the interpretation of other results observed is discussed.

Observations on the anatomy of teratological seedlings.—II, On the anatomy of some polycotylous seedlings of Centranthus ruber, D. BEXON (*Ann. Bot.* [*London*], *34* (*1920*), *No. 133, pp. 81–94, figs. 9*).—A study was carried out with polycotylous seedlings of *C. ruber* in the hope of discovering, among the abundant material by this species, evidence corroborative and supplemental as related to that obtained in the investigation of *Cheiranthus cheiri*, above noted, as to the origin of polycotyly. The vascular anatomy of a number of *C. ruber* seedlings showing all stages of polycotyly from hemitricotyly to tetracotyly is described. These, though they agree in broad outline with the types of structure found in *C. cheiri*, differ as to frequency of fusions between cotyledons and as to the presence noted in some seedlings of a cotyledon the median bundle of which retains its collateral structure. The significance of these features is discussed. The vascular anatomy of a twinned seedling is described, the twinning being due to the fusion of distinct embryos, or to the partial separation of the daughter cells resulting from the quantitative division of the embryo initial.

Some anomalies in monocotyledonous roots, A. V. SPRATT (*Ann. Bot.* [*London*], *34* (*1920*), *No. 133, pp. 99–105, pl. 1, fig. 1*).—The results of the present studies show that a large proportion of monocotyledonous natural orders contain members which have somewhat abnormal root structures. The anomaly consists in the filling of the pith of the stele, which is rather larger than usual, with scattered vascular elements. These are formed by secondary thickening or are differentiated at the growing point, and later in some cases coalesce to form a solid stele. Discussion is given of the roots of Dracæna, Pandanus, Yucca, and other plants.

Variation in Eranthis hyemalis, Ficaria verna, and other members of the Ranunculaceæ, with special reference to trimery and the origin of the perianth, E. J. SALISBURY (*Ann. Bot.* [*London*], *33* (*1919*), *No. 129, pp. 47–79, figs. 20*).—From an examination of variations, both meristic and substantive, in flowers of *E. hyemalis*, *F. verna*, and other members of the Ranunculaceæ, the author claims to have shown that meristic variation is exhibited in all the floral regions, involving a corresponding variation in the total number of parts present. Correlation is usually present between variations in the different parts of a flower, increase or decrease usually being exhibited simultaneously by the perianth, andrœcium, and gynæceum. Branched stamens are not infrequently present, and bifurcated petals have been observed in several members of the group. Increase in any one region is usually accompanied by an increase in the adjacent regions, so that transformation can not be assumed. Substantive variations of the nature of transitions are not infrequent, and emphasize such features as the foliar nature of the calyx or the staminodal character of the honey leaves. From the facts adduced, the author concludes that meristic variation is mainly the outcome of two tendencies, namely, fission and fusion, the causation of which is discussed.

Variation in Anemone apennina and Clematis vitalba, with special reference to trimery and abortion, E. J. SALISBURY (*Ann. Bot.* [*London*], *34* (*1920*), *No. 133, pp. 107–116, figs. 9*).—In the present paper, further data are furnished in support of views set forward in the communication noted above, relative to the essential trimery of the Ranunculaceæ and the variation of the number of constituents of the flower through fusion or fission.

A corn pollinator, M. C. COULTER (*Bot. Gaz., 68* (*1919*), *No. 1, pp. 63, 64, fig. 1*).—The construction and use of this pollinator, which is described and discussed, are said to be as simple as can be required, even in case of unskilled assistants. A dense cloud of pollen is blown over the silks with comparatively little waste. Pollination can readily be repeated if desired. The expense is slight. A certain difficulty in filling the pollinator, introduced by the height of the corn, appears to be unavoidable.

Some concepts in mycology.—An attempt at synthesis, W. B. BRIERLEY (*Brit. Mycol. Soc. Trans., 6* (*1918*), *pt. 2, pp. 204–235, fig. 1*).—This paper is a tentative essay toward synthesis in mycology. The author has followed out two of the possible lines of construction, namely, the species concept and the educability of fungi.

The preservation of artificial cultures of molds, H. F. TAGG (*Trans. and Proc. Bot. Soc. Edinb., 27* (*1919*), *pt. 4, pp. 335–337*).—A satisfactory culture of a nonliquefying fungus on nutrient gelatin or agar-agar may be prepared for keeping and handling indefinitely if killed with formalin vapor in the Petri dish and sealed while in a sterile condition. The organism and culture may be cut out, dried, and mounted on glass or cardboard. Other methods and modifications for different purposes are discussed.

On the alga-flora of some desiccated English soils: An important factor in soil biology, B. M. BRISTOL (*Ann. Bot.* [*London*], *34* (*1920*), *No. 133, pp. 35–80, pl. 1, figs. 12*).—The investigation by means of water cultures of 44 samples of soil from widely separated localities is said to have shown that there is a widely distributed ecological plant formation in cultivated soils consisting of moss protonemata and algæ, some of the most important of which are indicated. It is thought likely that the extensive algal formation must be of considerable economic importance in the biology of the soil. Six new species or varieties are described, 16 species already described are newly recorded for the British Islands, and a number of stages are depicted in the life histories of certain species already known.

Notes on some saprophytic species of fungi associated with diseased potato plants and tubers, G. H. PETHYBRIDGE (*Brit. Mycol. Soc. Trans., 6* (*1918*), *pt. 2, pp. 104–120, pls. 2*).—The author, in the course of work previously noted (E. S. R., 41, p. 748) bearing more particularly on other subjects, gave attention to a number of saprophytic species, some of which had not been adequately described. A few of these are dealt with in these notes as studied in pure cultures.

A biological and systematic study of Swedish Gymnosporangiums, J. ERIKSSON (*Compt. Rend. Acad. Sci.* [*Paris*], *168* (*1919*), *No. 9, pp. 470–473*).—*Juniper communis* in Sweden is attacked by *Gymnosporangium clavariæforme* and *G. tremelloides*. An account is given of the alternate or related forms and their hosts.

Merulius in North America, E. A. BURT (*Ann. Missouri Bot. Gard., 4* (*1917*), *No. 4, pp. 305–362, pls. 3, figs. 39*).—This contains descriptions of a large number of species of Merulius, with a key and index.

Cold resistance in marine algæ, H. Kylin (*Ber. Deut. Bot. Gesell., 35 (1917), No. 4, pp. 370–384*).—The author concludes from this study that death from cold in case of the plants herein employed is conditional upon the actual formation of ice, and that such death is due primarily to the withdrawal of water from the cell.

Production of citric acid by Sterigmatocystis nigra, M. Molliard (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 7, pp. 360–363*).—As a result of this work, the author corroborates certain statements of Wehmer (E. S. R., 5, pp. 127, 435, 1030) regarding the production of citric acid by fungi other than Citromyces, S. *nigra* producing citric acid under certain conditions.

Amygdalin as nutriment for Aspergillus niger, [I], II, H. J. Waterman (*K. Akad. Wetensch. Amsterdam, Verslag. Wis en Natuurk. Afd., 25 (1916–17), pt. 2, pp. 1033–1037, 1143–1145; also in [English Ed.], Proc. Sect. Sci., 19 (1916–17), pt. 2, pp. 922–927, 987–989*).

In the first of these papers, a study of the behavior of *A. niger* grown from spores inoculated at 33° into solutions containing 2 per cent amygdalin plus the necessary inorganic nutrients is said to have shown that amygdalin is assimilated by the living mycelium, also that the production of young mycelium occurs at the expense of the assimilated amygdalin. The data as tabulated also show that amygdalin is a better nutrient for this fungus than is glucose as regards at least the dry weight produced. This conclusion is said to agree with results previously obtained (E. S. R., 31, p. 225), showing that the presence of a benzol nucleus in the assimilated organic chemical compound increases the quantity of mold formed at the cost of this nutrient.

The author claims to have shown that, generally speaking, it is rather the quantity than the substance absorbed that causes overburdening of cells and accompanying retardation of growth; so that narcotic substances can be introduced into an organism without injury thereto. For this purpose the narcotic substance should be combined with one or more chemical compounds. A complex chemical compound then results, which can not overburden cells but from which the desired active substance may be formed within the cell.

The fact noted above, that amygdalin gives a greater weight increment of *A. niger* than does glucose, was confirmed in another way by a new series of experiments, reported in the second paper. From these it is concluded that amygdalin, without any preceding conversion into glucose, benzaldehyde, and hydrogen cyanid, is absorbed by the cells.

It is inferred that the addition of amygdalin diminishes the noxious influenc of benzaldehyde.

The biological significance of nucleoli, A. Meyer (*Ber. Deut. Bot. Gesell., 35 (1917), No. 3, pp. 333–338*).—This is largely a discussion of the findings an views of others regarding the nature and functions of nucleoli, chiefly as exemplified in a few plants which are named.

Colloidal studies on plasma in plants, T. Tadokoro (*Jour. Col. Agr. Hokkaido Imp. Univ., 8 (1919), No. 5, pp. 143–182, figs. 13*).—Sap expressed from pounded wheat seedlings was tested with different solutions of several salts for degree of alteration. The results as presented graphically show that different neutral salts produce greater or lesser changes in emulsive plasma colloids. Concentrations lethal for living cells cause notable alterations in their plasma colloids. The antagonisms observed are noted and discussed with their implications.

Hydrogen-ion concentration of plant juices, I, II, C. B. Clevenger (*Soil Sci., 8 (1919), No. 3, pp. 217–226, fig. 1; 227–242, fig. 1*).—This paper is in two parts.

I. *The accurate determination of the hydrogen-ion concentration of plant juices by means of the hydrogen electrode* (pp. 217–226). Employing in the study of acidity or H-ion concentration of plant juices a modification of the electrode vessel developed by Clark (E. S. R., 34, p. 804), and used by him with Lubs (E. S. R., 35, p. 801), the author obtained results believed to be more accurate than any previously reported on the study of plants in this regard. Duplicate measurements usually agree within 0.1 millivolt and constant potentials are maintained for some minutes at least. A table showing the possible accuracy is given.

II. *Factors affecting the acidity of hydrogen-ion concentration of plant juices* (pp. 227–242). Among the factors influencing acidity in plant juices are the time of standing, time of day (or night), stage of growth, portion of plant tested, and soil, illumination and temperature being probably also involved. Acidity measurements were made of oats, buckwheat, soy beans, and cowpeas. Acids accumulate during the night and are destroyed in the daytime. Diurnal changes in plant processes are also believed to be factors. The investigation reported has been largely on methods, and is regarded as preliminary.

Application of biochemical method to the study of indigenous orchids—Discovery of a new glucosid, E. Bourquelot and M. Bridel (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 13, pp. 701–703*).—Results are given of biochemical studies on several orchids named, with an account of the preparation and properties of a glucosid claimed to be new and named loroglossin.

Utilization of glucose and of levulose by higher plants, H. Colin (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 13, pp. 697–699*).—Referring to the varying ratios of dextrose to levulose in different portions of the plant, the author gives the results of analysis of different parts of beet, chicory, and Jerusalem artichoke. He states that any hypothesis of isomerism in this connection is insufficiently supported and prefers the view that dextrose and levulose migrate at different rates or else are unequally utilized by the plant. Differences in concentrations and viscosities are discussed in connection with views of other authors named.

The geotropic behavior of starch-free seedlings and the removal of starch from coleoptiles of the Gramineæ, C. Zollikofer (*Ber. Deut. Bot. Gesell., 36 (1918), No. 1, pp. 30–38*).—A detailed account is given of studies on *Tagetes erecta* and various other plants regarding the assumed connection between geotropic and phototropic responsiveness and the presence of starch.

The relation of aeration to the growth and activity of roots and its influence on the ecesis of plants in swamps, H. F. Bergman (*Ann. Bot. [London], 34 (1920), No. 133, pp. 13–33, figs. 3*).—The author gives an account of the development, conduct, and results of experimentation with several plants named in regard to their behavior when the roots were in abnormal relations as regards air supply.

Roots of land plants do not live under prolonged submergence. The submerged roots die, and new ones form at or near the water surface. In peat or sphagnum, land plants show a reduction of the entire plant in a way not evident in plants grown in soil with submerged roots. A number of observations and deductions are given with discussion.

Development of root systems under dune conditions, W. G. Waterman (*Bot. Gaz., 68 (1919), No. 1, pp. 22–53, figs. 17*).—This account emphasizes the necessity of interpreting the extension of root systems not only in regard to structure and function but also in regard to the causes of such extension. The study is said to have shown that dune sand as a substratum for plant growth is remarkable for the uniformity of its texture and for the absence of mineral salts required by plants. It is homogeneous chemically, but it contains old soil layers and minute streaks and patches, apparently of carbonaceous and organic origin, also dead plants, all these being very irregularly distributed.

Roots of dune species react differently to the elements of this structure, these reactions being specific and hereditary and reflecting possibly some growth conditions of the ancestral plants. They are regarded as of great importance in the choosing of species for introduction into conditions where the humus content is uneven. After making due allowance for such influencing factors as moisture, oxygen, and penetrability, the evidence indicates nutrient or at least chemical influence as the cause of variability in symmetry in the extension of roots under dune conditions.

Under certain conditions, the root apparently utilizes organic matter directly, at the expense of its shoots. Extreme lengthening and thickening of roots occurring under these conditions call into question the value of the common method of estimating plant growth by measuring the length and weight of roots.

The mechanics of water provision [in plants], O. RENNER (*Ber. Deut. Bot. Gesell., 36 (1918), No. 3, pp. 172–179; abs. in Bot. Gaz., 68 (1919), No. 1, p. 72*).—In an account of studies pursuing phases related to those previously investigated (E. S. R., 28, pp. 729, 822; 35, p. 432), the author presents data with a discussion regarding the forces, energy, and processes involved.

The influence of contact stimulus and mechanical rubbing on the growth and on the turgescence of seedlings, P. STARK (*Ber. Deut. Bot. Gesell., 35 (1917), No. 3, pp. 266–291, figs. 3*).—The data herein presented lead the author to the conclusion that the stems of young seedlings curve in response to contact stimulus in either of two ways, according as the plant is kept in a dry or in a damp atmosphere.

Influence of light on absorption by plants of organic matters from the soil, D. C. DE BESTEIRO and MICHEL-DURAND (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 9, pp. 467–470*).—A study carried out with the heliophilous plant *Pisum sativum* (to be followed by a study of a heliophobic plant) is said to have shown a greater augmentation of dry weight corresponding to the greater intensity of illumination, the greater development being apparent in underground as well as in aerial parts.

The individual plants took more glucose from the nutritive medium under the greater illumination.

A given weight of roots absorbed more glucose in weak than in strong illumination. A given weight of a plant as a whole absorbed from the medium sensibly the same amount of glucose in different intensities of illumination.

These results as a whole with their implications are considered to show that the pea, a heliophilous plant, is not able to adapt its chlorophyll assimilation to weak illumination intensities, and that it is incapable of augmenting the absorptive power of its roots so as to take from the soil a large quantity of organic carbon. There is, then, in case of this plant, neither parallel nor compensation between absorption of carbon by the green leaves in the carbon dioxid of ordinary air and the absorption of organic carbon by the roots in the soil.

The influence of light- and gravitational stimuli on the seedlings of Avena sativa, when free oxygen is wholly or partially removed, U. P. VAN AMEIJDEN (*K. Akad. Wetensch. Amsterdam, Verslag. Wis en Natuurk. Afd., 25 (1916–17), pt. 2, pp. 1135–1143; also in [English Ed.], Proc. Sect. Sci., 19 (1916–17), pt. 2, pp. 1165–1173*).—Experiments were carried on with *A. sativa* seedlings under a total pressure of one atmosphere maintained by replacing removed oxygen with nitrogen.

Geotropic response was diminished by a fore period of 5 hours in nitrogen, and was absent after a fore period of 6 hours. Phototropic response was apparently unchanged after 3 hours in nitrogen. It was still perceptible after a 6-hour immersion, but after 8 hours in nitrogen it was entirely absent. When nitrogen was replaced by air after 65 or 75 minutes, a slight after effect began to be apparent about 1 hour later, showing that so-called perception had occurred but that oxygen was required to show a reaction. After a fore period of 24 hours in 4 to 5 per cent oxygen, the plants in ordinary air showed an influence on perception, the seedlings remaining able for a long time to perceive a geotropic or a phototropic stimulus in an atmosphere containing a relatively low percentage of oxygen.

The minimum illumination period causing germination in seeds of Lythrum salicaria, E. Lehmann (*Ber. Deut. Bot. Gesell., 36 (1918), No. 3, pp. 157–163*).—Strong illumination produced much earlier and more abundant germination in seeds of *L. salicaria* than was obtained in seed not so exposed.

Energy curves of light absorption by the colorants of green leaves, A. Ursprung (*Ber. Deut. Bot. Gesell., 36 (1918), No. 3, pp. 111–121, figs. 4*).—This is largely a discussion of data and views contributed by other authors on the relations between sunlight (direct or diffused, high or low) incident upon plant surfaces, and the processes and in general the phenomena related thereto, with more particular reference to the chlorophyll grains, the red coloring material in the cell sap, and the protection supposedly afforded thereby against incident solar energy.

Apparatus for the study of photosynthesis and respiration, W. J. V. Osterhout (*Bot. Gaz., 68 (1919), No. 1, pp. 60–62, fig. 1*).—The author, having sought to combine the two methods formerly noted (E. S. R., 39, p. 432), dealing with measurement of photosynthesis in land plants and in aquatics respectively, has carried on experiments to this end and presents herein a simple method for the study of photosynthesis and respiration.

The method, which is said to be so simple and convenient as to be adapted to classroom demonstration as well as to investigation, consists essentially in placing the plants in a chamber in which the gas is made to bubble through an indicator, the color indicating alterations in the carbon dioxid tension.

Photochemical extinction during the process of assimilation, A. Ursprung (*Ber. Deut. Bot. Gesell., 36 (1918), No. 3, pp. 122–135, figs. 2*).—The author reports with discussion a study and resulting data regarding the absorption of solar energy in different portions of the solar spectrum by leaves of different plants.

The injurious effects of ultra-violet rays, A. Ursprung and G. Blum (*Ber. Deut. Bot. Gesell., 35 (1917), No. 4, pp. 385–402*).—A comparative study of the influence of ultra-violet rays on plants of several species is followed by a discussion of their relative resistances to the injurious effects of these rays, and the basis of such resistance, such as absorption of the rays by the epidermis.

Effect of illuminating gas on plants, C. Wehmer (*Ber. Deut. Bot. Gesell., 36 (1918), No. 3, pp. 140–150, pl. 1, figs. 5; abs. in Bot. Gaz., 67 (1919), No. 6, p. 517*).—In the production of injury by illuminating gas to the root systems of woody plants, the author states that within the age limits of the plants employed (less than seven years) the stage of development was an important factor. Resistance was at a maximum during the winter, but was much less during late summer and fall, and least during the spring; the gas exercising apparently a positively poisonous influence. The trouble is due primarily to root injury. A more specialized report on the toxic constituents is promised.

A biological and systematic study of Philippine plant galls, L. B. Uichanco (*Philippine Jour. Sci., 14 (1919), No. 5, pp. 527–554, pls. 15*).—This is, in the main, an account of galls due to different species of insects. It is stated that galls can be produced only when the tissue of the plant is interfered with during or prior to the actual development of the tissue, no stimulus, whether physical or chemical producing galls after full maturity of the tissue has been attained.

FIELD CROPS.

Safe farming in the Southern States in 1920, B. KNAPP (*U. S. Dept. Agr., Dept. Circ. 85 (1920), pp. 19*).—This comprises a discussion of economic factors affecting farming in the South, and outlines as a safe farm system one which will maintain soil fertility; furnish a sufficient supply of both food and feed to insure a surplus; and provide for the production of cotton, tobacco, rice, or sugar cane as strictly cash crops, depending on the locality. Tabulated statistics are appended showing the acreage and yield by States, for the Southern States, of cotton, corn, wheat, oats, hay, Irish potatoes, sweet potatoes, and rice, for the period of 1909–1919, inclusive, and of peanuts, grain sorghums, and velvet beans for shorter periods of time.

[Report of field crops work at the Morris substation, 1918], P. E. MILLER (*Minnesota Sta., Rpt. Morris Substa., 1918, pp. 5–38, figs. 9*).—A report is presented on the progress of work along the same general lines as that heretofore noted (E. S. R., 39, p. 436), including meteorological data. The results for the 4 years 1915–1918 are given in tables.

In the fertilizer experiments with crops in rotation corn and oats were replaced in 1918 by wheat. This arrangement placed wheat on fall-plowed clover sod, fall-plowed wheat stubble, and on corn stubble disked in the spring. The average yield of 3 plats showed that in each series the plats with no treatment gave the lowest and the plats receiving acid phosphate and manure the highest production of grain. The ranges in yield were as follows: Clover sod 17.2 to 22.1 bu., wheat stubble 26.1 to 30.1 bu., and corn stubble 29.7 to 39.1 bu. per acre.

The results of fertilizer experiments with alfalfa in progress since 1915 showed that acid phosphate, used at the rate of 480 lbs. per acre annually, was the only fertilizer application that has thus far given a distinct benefit. The results of manuring clover and timothy sod at the rate of 32, 16, 8, and 4 tons per acre in a rotation of corn, wheat, barley, and clover and timothy, as shown by the yields of wheat and barley, were generally in favor of the smallest application and of no treatment. In tests of wheat straw and corn stover at the rates of 1 and 2 tons per acre as fertilizers for wheat and corn the better response was secured from corn, while wheat showed but little improvement. The results indicated that the cumulative effect of such crop residues may be highly beneficial though not apparent in the first crop.

The yields of corn and wheat secured in a series of rotations, including alfalfa, were best when corn followed alfalfa and wheat followed corn. The clover utilization test led to the conclusion that on the soil under experiment, which is rich in organic matter, plowing under clover is wasteful when it can be used as hay or pasture.

The highest yielding varieties of different crops tested in 1918 were as follows: Mindum, a durum wheat, 23.3 bu.; Marquis wheat 21.6 bu.; Kherson oats 53.1 bu.; Minnesota Manchuria barley, a 6-rowed variety, 36.1 bu.; Wisconsin Pedigreed rye 29.8 bu.; White spring emmer 30.9 bu.; Northwestern Dent corn 42.2 bu.; Green Mountain potatoes 149.9 bu.; and Minnsoja soy beans 12.4 bu. per acre. Among alfalfa varieties Grimm and Baltic proved the best yielders and the hardiest varieties. Breeding work carried on with Minnesota No. 13 corn is reported as resulting in earlier maturity without reduction in the yield. In seeding experiments with oats the use of 80 lbs. per acre gave the highest average yield of grain. It was observed during the season that the height of grain on the different plats was in direct relation to the thickness of seeding, which ranged from 48 to 112 lbs. per acre, the thinnest seeding producing the tallest plants with the largest heads.

[Report of field crops work at the Dickinson substation, 1914–1918], L. R. Waldron and J. C. Thysell (*North Dakota Sta. Bul. 131* (*1919*), *pp. 3–50, 63–79, 80–82, fig. 1*).—The work with field crops for each of the 5 years, 1914–1918, is described in the seventh to the eleventh annual reports of the substation, continuing previous work (E. S. R., 35, p. 228). The weather conditions for each year are noted and the experimental results are briefly discussed. The work was along the same general lines from year to year, and had reference mainly to variety and cultural tests with cereal and forage crops, flax, and potatoes.

As in the preceding years, the work with cereal crops in 1918 included principally testing and improving varieties and comparing different dates and rates of seeding. In 1918 D-5 ranked first in yield among the durum varieties of wheat with 20.2 bu. per acre, while in the fife group Ghirka No. 5 led with 17.6 bu., in the bearded group of common wheats Kubanka Bluestem with 17.4 bu., and in the bluestem group Haynes or Minnesota 169 with 14.3 bu. For the 5 years, 1914–1918, the leading varieties and their average yields for the respective groups were as follows: Monad 24.9, Marquis 18.3, Preston 14.8, and Crossbred 12.9 bu. per acre.

In 1918 seeding Kubanka No. 8 wheat at the rates of 3, 4, 5, and 6 pk. per acre on April 5 and 22 and May 1 gave an average yield of 17.3, 20.1, 19.2, and 18 bu. per acre respectively, while the average yields for the different dates of seeding at the various rates were 21.4, 17.9, and 16.6 bu. per acre, respectivly. Of winter rye, spring rye, Beloglina winter wheat, and Kubanka spring wheat, sown November 3, 1917, only winter rye survived the winter.

In 1918 the leading variety of oats, Golden Rain, yielded 49.5 bu. per acre, and this variety also stood first in average yield for the 6 years, 1913–1918, with 59.1 bu. per acre. Among 5 varieties of 2-rowed hulled barley Steigum produced the highest yield, 23.6 bu. per acre, and among 4 varieties of 6-rowed hulled barley Mariout led with 22.8 bu. per acre, being closely followed by Gatami with 22.2 bu. Of four varieties of 2-rowed barley, not including Steigum, which were grown from 1914–1918, Swan Neck ranked first with an average yield of 30.9 bu., and of 3 varieties of 6-rowed barley Gatami led with 25.3 bu. per acre for the period. Hannchen, a 2-rowed barley, sown at different rates from 1913–1918, inclusive, gave the best average yield from the use of 6 pk. of seed per acre.

The results of a flax variety test showed the best yields of linseed from Select Russian and N. D. R. 52. Flax grown in a mixture with each of the grains, wheat, oats, and barley, in 1917 and 1918 did not succeed.

Tests with grain sorghum indicated that the crop is not adapted to the climate. Wheat grown after various crops and after fallow gave the following average results for 10 years: After corn 23, fallow 25.7, peas 21, sweet clover 20.4, winter rye 2.17, oats 18.2, and wheat 15.1 bu. per acre. In a test of corn varieties in 1918 Mercer Flint gave the best results, yielding in one instance 6,940 lbs. of green substance per acre. The highest yield of potatoes for the year, 135 bu. per acre, was secured from Burbank. A test of silage crops resulted in a yield of green fodder of 12,260 lbs. from corn, 21,029 lbs. from sunflowers, and 40,824 lbs. per acre from mangels.

Annual report of chief soil and crop instructor, H. O. English (*Brit. Columbia Dept. Agr. Ann. Rpt., 11* (*1916*), *pp. 75–78*).—The work with field crops at demonstration stations located at Armstrong, Chilliwack, Edgewood, Errington, Grand Forks, Rock Creek, Rose Hill, and Pitt Meadows, is briefly noted. The crops tested were mainly wheat, corn, oats, peas, clover, alfalfa, vetch, and mangels.

Annual report of district agriculturist, Fort George district, H. E. Walker (*Brit. Columbia Dept. Agr. Ann. Rpt., 11* (*1916*), *pp. 89–91*).—A brief report is given on the general agricultural conditions of the district, and the results of growing crops on demonstration plats at Fort George are briefly noted. The following varieties are mentioned as suitable for the region: Abundance and Banner oats; O. A. C. No. 21 and Wisconsin 55 barley; Red Wave and Dawson Golden Chaff winter wheat; Marquis and Bluestem spring wheat; Red, Early Rose, Gold Coin, and Reliance potatoes; and Grimm alfalfa. Good results were secured with redtop, timothy, rye grass, and brome grass.

[Grass mixtures for meadows and pastures on peaty soils], H. Osvald (*Svenska Mosskulturför. Tidskr., 34* (*1920*), *No. 1, pp. 1–16, fig. 1*).—In a paper presented at a meeting of the Swedish Moor Culture Association in 1919, the author summarizes in tables and discusses the results of experiments with different grass mixtures for meadows and pastures on peaty soil, conducted mainly at Flahult and Torestorp.

At Flahult the growth of a seed mixture consisting of 20 per cent alsike clover, 10 per cent white clover, 35 per cent timothy, 10 per cent meadow foxtail, 20 per cent meadow fescue, and 5 per cent blue grass was studied for the 5 years 1914–1918. Alsike clover produced the largest percentage of total forage, over 21 per cent, the first 2 years, and timothy gave the best results the second and third years when it constituted, respectively, 68.1 and 61 per cent of the yield. It was further observed that the third year the grasses began to produce plants that did not develop stems but remained of a leafy character and the percentage of such leafy plants showed a tendency to increase during the following years.

In a similar study at Torestorp for the 3 years, 1916–1918, with a mixture of 5 per cent red clover, 20 per cent alsike clover, 50 per cent timothy, 5 per cent meadow foxtail, 10 per cent meadow fescue, and 10 per cent orchard grass, plants of a leafy character appeared the first year in all the grasses, but they showed marked increases only in timothy and meadow fescue. The first year timothy constituted 88.2 per cent, the second year 80.2 per cent, and the third year 57.6 per cent of the yield. The third year meadow fescue made up 26 per cent of the crop, and 51.6 per cent of the forage produced consisted of leafy plants of timothy and 21.5 per cent of leafy plants of meadow fescue.

A botanical analysis made at Flahult in 1917–18 of the hay grown from the mixture given above, but including *Poa trivialis* and sown at different dates in May, June, July, and August, showed that timothy and meadow foxtail produced the largest percentage of plants developing stems during the first year of their growth, while the second year the relationship between the number of such plants and of those producing only foliage and incompletely developed stems was practically reversed. Meadow fescue did not show this tendency very definitely, and *P. trivialis* produced practically no plants with undeveloped stems.

Observations made from 1910 to 1918, inclusive, on the behavior of clover and grasses sown as a mixture for meadow purposes indicated that alsike clover produced its best growth the first year, timothy the second, meadow foxtail the sixth, and blue grass the ninth year. It is pointed out from this result that by the proper selection of species in the seed mixture it is possible to maintain the productive capacity during the period the meadow is to remain.

Similar studies of 25-year and 8-year old meadows showed that white clover and blue grass made up the principal part of the forage produced.

[Grassland in the United Kingdom and its improvement and maintenance], W. Somerville (*Nature* [*London*], *104* (*1919*), *No. 2617*, *pp. 421–425*).—This article reproduces in abridged form the address of the president of the section on agriculture of the British Association, previously noted editorially (E. S. R., 42, p. 106).

Investigation of blossoming and fertilization in winter rye and winter wheat, E. Obermayer (*Ztschr. Pflanzenzücht.*, *4* (*1916*), *No. 4*, *pp. 347–403*).—These studies, conducted at Magyaróvár in Hungary, indicated that the manner and duration of blossoming in winter rye and winter wheat shows wider variations there than was observed by investigators in other countries.

The greatest variation occurred in the time required for the closing of the glumes after the flower was fertilized. The general manner of blossoming in rye was in some instances sudden and rapid and in others slow or sporadic and fluctuating. Wheat differed from rye in that the manner of blossoming was usually irregular and very seldom sudden and rapid. The individual selections of rye blossomed with greater uniformity than was observed in similar wheat selections.

The blossoming of rye flowers without opening was observed as being only exceptional, while single wheat flowers blossoming unopened could be found at all times during the blossoming period and under certain conditions the phenomenon became more or less general. A somewhat similar process of blossoming was observed in rye and wheat flowers that had only partly opened. When sudden and intense blossoming of rye was imminent it was noted that some time before the opening of the flowers the anthers pushed against the glumes and spread them apart, but this was never observed in wheat.

The simultaneous opening of a sufficient number of wheat and rye flowers was attended by a crackling noise. Spikes with sterile anthers were observed to be quite frequent in both rye and wheat.

Weather conditions influenced the process of blossoming in the individual flower as well as over the field. Cloudiness, low morning temperatures, and warm winds were not unfavorable, but a low temperature associated with rainy, windy weather interfered with the normal progress of blossoming in both crops.

The condition of the floral organs, especially of the male parts, exerted a marked influence on fertilization. Differences in the structure of these organs were studied, and it was found that while such differences occur in healthy material they are much more marked in sterile pollen grains, immature pollen, pollen gathered and kept near its limit of time, and in spikes with sterile anthers. It was noted that a healthy pollen of high vitality contains, as a rule, but few sterile grains. The shriveling of pollen grains due to the loss of moisture within certain time limits did not in itself reduce viability. Rye pollen when gathered remained viable only from 2½ to 3 hours, and immature pollen was incapable of effecting fertilization. A study of the size of rye and wheat pollen indicated that the pollen of the Hungarian wheat studied was larger than the pollen of *Triticum dicoccoides*, which in turn was larger than that of *T. turgidum mirabile*. In laboratory germination tests with rye pollen grains the optimum cane sugar concentration used in an agar-agar cell was a little above 30 per cent. Keeping rye pollen exposed to the air but in the dark showed no advantage over keeping it similarly exposed in the shade, and placing it into a desiccator proved injurious.

The condition of the female flower organs was found to influence fertilization mainly through the supply of nutrition available to each fertilized flower for the development of the young fruit. Fertilization seemed quite generally brought about, but the inner or secondary flowers in the spike apparently were not always vigorous enough to obtain the necessary nutrition for which they had to compete with the usually stronger outer blossoms. The variation in strength or vigor of the inner flowers is regarded as a heritable character.

Studies were made also to determine the degree of self and cross fertilization in rye and wheat. Cross fertilization was found to be the more general method of fertilization in rye, although self fertilization also occurred, especially in the beginning of the blossoming season, at times of sporadic flowering, and in closed or only partly opened blossoms. Wheat was observed to be generally self fertilized, but under certain conditions cross fertilization also took place.

[The sorghum sirup industry and the sorghum plant], J. J. WILLAMAN, R. M. WEST, and C. P. BULL (*Minnesota Sta. Bul. 187* (*1919*), *pp. 7–31, figs. 13*).—The history and present status of the sorghum sirup industry in Minnesota is briefly reviewed, while the botany and the culture of the sorghum plant are treated at greater length.

The results of testing seven varieties of strains of saccharin sorghums in 1900 and 1901 showed that Folgers led with a yield of 12.67 tons of green cane per acre, being followed by Amber with 11.66 tons and Collier with 11.22 tons. The sugar content ranged from 12.28 per cent in Colman to 14.46 per cent in a strain of Minnesota Early Amber. The Minnesota Amber strains being of early maturity gave the smaller yields of green cane per acre, but gave indications of a high sugar content.

Varieties and strains tested in 1912 and 1913 showed great variation in all the characters observed. South Dakota ranked first in maturity although Early Rose, a strain selected in Minnesota, showed practically the same earliness. The highest average yield, 19.1 tons of green cane per acre, was obtained from S. P. I. 17,566 Orange, being followed by Amber with 17.9 tons, S. P. I. 17,548 Red Amber with 15.3 tons, and Orange with 15.2 tons.

The culture of sweet sorghum for forage is discussed, and the results of growing Early Amber for this purpose are compared in general with the similar use of Minnesota No. 13 corn. The results of analyses of sweet sorghum fodder and corn fodder are given in a table. Directions are given for the improvement of the crop by seed selection.

The results of field experiments with sugar cane in the years 1917–18, J. KUIJPER (*Arch. Suikerindus. Nederland. Indië, 27* (*1919*), *No. 51, pp. 2245–2320; also in Meded. Proefsta. Java-Suikerindus., Landbouwk. Ser., No. 5* (*1919*), *pp. 2245–2320*).—The sugar experiment station at Pasoeroean in 1917–18 made about 1,000 plat tests on different soil types with sugar cane varieties, including a number of new strains originated at the station. On nearly all soil types the best results were secured with the variety EK 28, but on rather wet soils an older variety, 247 B, proved most satisfactory. A study of the comparative yielding capacity of different varieties showed that varieties EK 28 and EK 2 stood distinctly above 247 B in this regard. The varieties now considered best for Java are EK 28, EK 2, 247 B, DI 52, 100 POJ, SW 3, and 90 F. The older Black Cheribon cane is reported as having almost disappeared from cultivation.

The results of fertilizer experiments indicated that among different sources of nitrogen ammonium sulphate, as compared with nitrate of potash, cyanamid, peanut cake, dried blood, meat meal, filter presscake, and stable manure, gave the best returns. Stable manure and filter presscake had no value as sources of nitrogen, but stable manure was apparently a good source of phosphoric acid.

Bagasse ashes had some fertilizing value on the different soil types, and molasses as a fertilizer is reported as giving good results on coarse sandy soils.

A study was made also of the use of seed cane grown at high altitudes in relation to the control of sereh disease. It was found that tops of full-grown cane and cuttings from planting cane from higher altitudes, when healthy, were of equal value for planting, but that under unfavorable soil conditions the tops as compared with the cuttings were more readily attacked by the disease. Cuttings infected with yellow stripe disease, as a rule, showed a reduced sugar yield in the crop.

Binding the stalks together to prevent the cane from falling down did not prove of advantage, and no profitable increases in yield were secured from minor changes in the culture and the planting of cane.

HORTICULTURE.

[Report on fruits, ornamentals, and vegetables], P. E. Miller (*Minnesota Sta., Rpt. Morris Substa., 1918, pp. 38–44, figs. 2*).—A statement of varieties of fruit, ornamentals, and vegetables under trial at the West Central substation at Morris, Minn., in 1918, including tabular data on tests of ornamental shrubs and annuals. The varieties of vegetables listed are recommended for general planting in the region of the substation.

[Report on fruit investigations], W. Burns (*Ann. Rpt. Dept. Agr. Bombay, 1916–17, pp. 55, 56*).—Brief notes are given on experimental work conducted during the year 1916–17 with the mango, citrus fruits, guava, papaya, grape, fig, and banana.

Experiments in budding the mango have shown that the mango scion will not flower until it is sufficiently mature, even if it is grafted on a mature stock. Mango flies have been successfully trapped by using a distillate of the Tulsi (*Ocimum sanctum*) plant, a method devised by R. Rao Karsagode. Spraying mango trees with water during the flowering period interfered with the setting of fruit, and confirmed the belief in the detrimental effect of rain at this period.

Incosopol, a cotton oil product, has proved an effective remedy for aphis on citrus. The sucking moth (*Ophideris fullonica*) has been traced as the cause of considerable falling of citrus fruits, and measures are being devised against it.

An attempt to reduce seeds in guavas by selection and vegetative propagation has not given promising results thus far. The sugar content of guavas was found to increase as the trees became mature. Guava stocks have exerted no influence on the color of the scion fruit.

Crosses made with papayas have shown that the production of pure male plants can be eliminated by the use of hermaphrodite plants as pollen plants. Propagation of papayas by cuttings in the field was not successful, as the cuttings were apt to rot at the base. The artificial branching of the papaya by removing the top resulted in low stocky trees and an increased number of fruits.

Spray calendar (*Arkansas Sta. Circ. 48 (1920), pp. 4*).—A spray calendar for apples, pears, peaches, plums, cherries, and grapes, with directions for preparing spray mixtures.

Orchard spray calendar, C. E. Sanborn and D. C. Mooring (*Okla. Agr. Col. Ext. Circ. 109 (1919), pp. 8, figs. 7*).—A spray calendar for the control of the more important pests and diseases of orchard and small fruits, including directions for making spray solutions.

More about rootstocks, W. L. Howard (*Mo. Bul. Dept. Agr. Cal., 9 (1920), No. 3, pp. 93–95, fig. 1*).—In continuation of a previous report on rootstock experiments at the California Experiment Station (E. S. R., 40, p. 444), the author presents some additional notes on the value of different roots as stocks for prunes and pears.

[Note on raising seedling apples], E. LAXTON (*Jour. Pomol., Vol. 1, No. 2, pp. 104–109*).—Notes are given on methods used by the author and W. Laxton in breeding apple seedlings, together with tabular data showing the crosses made and the principal characteristics of the progeny.

Peach growing in Florida, W. L. FLOYD (*Fla. Univ. Ext. Bul. 27 (1920), pp. 15, figs. 8*).—This bulletin deals with the culture and care of peaches, particularly in the home orchard.

Magnesia and the manuring of vines, J. LEFÈVRE (*Rev. Vitic., 51 (1919), No. 1329, pp. 394–398, figs. 2*).—A brief summary of the knowledge relative to the use of magnesium as a fertilizer, with special reference to its use for grapes.

Special attention is called to the combination of magnesium and calcium oxids which is manufactured by several factories in France and sold under the name of dolomagnesium. When the magnesium is administered in this form, either alone or in combination with other fertilizers, it has none of the toxic effects of magnesium sulphate and chlorid. In addition to its value as a direct nutrient and in amending acid soils it has also an antichloritic action. A number of experiments conducted under varying conditions indicate that a normal dose of dolomagnesium is from 500 to 1,000 kg. per hectare; 2,000 kg. per hectare (1,780 lbs. per acre) may be used without injury in making an initial application. Dolomagnesium may be mixed with other fertilizers except nitrogenous fertilizers.

Conservation of fresh grapes, J. FIGUEROA (*Dir. Jen. Serv. Agr. [Chile] Bol. 52 (1919), pp. 27, figs. 18*).—An account of the principal processes by which grapes are preserved in the fresh state.

Statistics in the production of grapes and wine in 1919 (*Estadis. Prod. Vitic. [Spain], 1919, pp. 7*).—A statistical report on the production of grapes and wines in various regions and Provinces of Spain during the year 1919.

The propagation of some tropical fruits, R. S. CUNLIFFE (*Agr. News [Barbados], 19 (1920), No. 465, pp. 52, 53, fig. 1*).—The present paper discusses the propagation of avocados. Subsequent notes are to deal with other tropical fruits.

The mango in Florida, E. D. VOSBURY (*Fla. Grower, 21 (1920), No. 10, pp. 8, 9, 35, 37*).—Practical suggestions are given for growing mangos, including information relative to soil requirements, varieties, method of propagation, grove management, the control of pests and diseases, harvesting and marketing the crop, yields, and profits.

The dwarf coconut, W. P. HANDOVER (*Agr. Bul. Fed. Malay States, 7 (1919), No. 5, pp. 295–297*).—An account of a dwarf form of coconut growing in the Federated Malay States, with reference to its distinguishing characteristics, history, growth, and yield.

The status of the American nut industry, C. A. REED (*Amer. Nut Jour., 12 (1920), No. 3, p. 41*).—A brief discussion of the present status of the various nut industries in the United States.

Top-working the pecan, E. J. KYLE (*Proc. Natl. Nut Growers' Assoc., 14 (1915), pp. 93–96*).—A contribution from the Texas College, discussing conditions under which top-working is advantageous and methods of budding that may be employed.

Control of the sap flow in stocks to be grafted, J. F. JONES (*Proc. Natl. Nut Growers' Assoc., 14 (1915), pp. 96, 97*).—The author's experience in grafting the English walnut, shagbark hickory, and pecan under northern conditions has shown that to secure uniformly good results the scions must be vigorous, well-matured, and perfectly dormant; the stocks must be vigorous and the sap active, but not excessively so. To control the flow of sap the stocks are repeatedly cut back as growth starts, cutting off only sufficient of the previous season's wood to remove all buds that have started to grow. This operation is repeated every week or 10 days, thereby not only prolonging the grafting season but insuring better stands of grafts than on unmanipulated stocks.

[Report on trees, shrubs, and hedges], J. C. THYSELL (*North Dakota Sta. Bul. 131* (*1919*), *p. 79*).—A brief note on the condition of demonstration plantings of trees, shrubs, and hedges.

Report on the treatment of the surroundings of the small home, H. B. and L. A. DUNINGTON GRUBB (*Toronto: Ontario Housing Com., 1919, pp. 35, figs. 20*).—This report was prepared at the request of the Ontario Housing Committee, with the view of suggesting means of beautifying the individual lot and of outlining the general principles which govern the attractive and economical development of any new area.

Part 1 of the report deals with the general development of land for industrial housing. It discusses the subdivision of land with reference to efficiency, beauty, and economy. Part 2 deals with the layout of the individual lot and contains several plans, together with a list of trees, shrubs, flowers, and vegetables suitable for community and industrial gardens.

FORESTRY.

Making woodlands profitable in the Southern States, W. R. MATTOON (*U. S. Dept. Agr., Farmers' Bul. 1071* (*1920*), *pp. 38, figs. 55*).—A contribution from the Forest Service of this Department discussing how farm forestry pays, marketing timber profitably, supplying timber for farm needs, utilizing farm timber rightly, profitable employment for winter, protecting woodland from injury, improving woodland by cutting, making waste land profitable, increasing the sale value of the farm, and forestry demonstrations in progress. The various topics are well illustrated, and a reference list is given of related literature published by this Department and by various Southern States.

The new Grand Canyon National Park, R. S. YARD (*Natl. Parks Assoc. Pub. 1* (*1919*), *pp. 24, figs. 13*).—An analysis of the scenic features of this park, with suggestions for its better comprehension and enjoyment.

The new Zion National Park, R. S. YARD (*Natl. Parks Assoc. Pub. 2* (*1920*), *pp. 31, figs. 16*).—A descriptive account of the scenic features of the Zion National Park and the relation of this park, together with the Grand Canyon and Bryce Canyon, to the brilliantly colored plateau country of southern Utah.

Annual return of statistics relating to forest administration in British India for the year 1917–18 (*Ann. Return Statis. Forest Admin. Brit. India, 1917–18, pp. 25, pl. 1*).—A statistical review showing alterations in forest areas and progress made in forest settlements, surveys, working plans, forest protection, etc., including also yields in major and minor forest products, revenues and expenditures, with comparative data showing the annual forest revenue, expenditure, etc., for the last 10 years.

The forest policy of France: Its vindication, W. B. GREELEY (*Amer. Forestry, 25* (*1919*), *No. 310, pp. 1379–1385, 1424, figs. 8*).—A general account of the history, development, and accomplishments of organized forestry in France, in which the author points out how thoroughly the long established French forest policy was vindicated during the great war.

Conservation: The form or the substance: Which? W. COMPTON (*Chicago: Natl. Lumber Manfrs. Assoc., 1919, pp. 24*).—In this paper the author presents and discusses a number of principles which it is believed should underlie a national policy of forest protection and replacement.

Some problems of reafforestation, W. Somerville (*London: John Murray, 1919, pp. 13*).—This paper is primarily a discussion of species and mixtures of species suitable for reafforesting British woodlands.

On the growth, treatment, and structure of some common hardwoods, R. T. Patton (*Proc. Roy. Soc. Victoria, n. ser., 31 (1919), No. 2, pp. 394–411, pl. 1, figs. 7*).—This paper deals chiefly with a study of the growth of the mountain ash (*Eucalyptus regnans*).

Trial of an experimental dendrometrical table for chestnut coppice, G. Di Tella (*Ann. R. Ist. Super. Forestale Naz. Firenze, 4 (1918–19), pp. 105–156, figs. 8*).—The table here presented and discussed in detail was constructed from measurements made of 475 felled trees. The steps used in constructing the table are given in detail.

The koa tree, C. S. Judd (*Hawaii. Forester and Agr., 17 (1920), No. 2, pp. 30–35, pls. 3*).—A descriptive account of the koa tree (*Acacia koa*) of Hawaii, including information relative to uses of the wood. Attention is also called to the value of this tree for reforesting denuded areas where good drainage and favorable soil and moisture conditions obtain.

A contribution to the knowledge of the wood of the bravo pine, J. G. A. Cardoso (*Bol. Assoc. Cent. Agr. Portuguesa, 20 (1918), Nos. 9, pp. 296–305; 10, pp. 325–333; 12, pp. 391–402, figs. 6*).—The author presents the results of a micrographical study of the wood structure of the bravo pine (*Pinus pinaster*).

The origin, extraction, and value of coniferous seeds, I, L. Piccioli (*Ann. R. Ist. Super. Forestale Naz. Firenze, 4 (1918–19), pp. 1–93, figs. 57*).—This is part 1 of an exposition on the coniferous seed industry. Its successive chapters discuss the importance of the inheritance of mutations; influence of place of origin on seed; a defense of importation; private, commercial, and State seed production; the influence of tree selection on the quality of the seed; periodicity of abundant harvests, and causes which determine them; harvesting the fruit; methods and equipment for seed extraction; diswinging and cleaning; the relation between volume and weight of whole fruits and of seed in different species; cost of production and market value of seeds; and germination, longevity, and storage of seeds.

DISEASES OF PLANTS.

Annual report of provincial plant pathologist, J. W. Eastham (*Brit. Columbia Dept. Agr. Ann. Rpt., 12 (1917), pp. 51–56*).—In this report it is stated that a fairly comprehensive plant disease survey with record of results has now been made of the fruit-growing districts of British Columbia.

A case of mushroom apple-root rot was noted in the Shuswap district, the whole orchard being reported as being in a dying condition. A fungus appears to pass from the remains of old natural trees and shrubs to the apple roots, and probably to other trees.

Apple tree anthracnose control tests resulted decisively in favor of early sprayings. In case of apples placed in cellar storage until after Christmas it was found that the Bordeaux mixture had disappeared, supposedly due to the sweating of the fruit. The experiment was continued as possibly having an important bearing on the value of early spraying. An apple scab control test employing on one tree as a spray lime sulphur at the three periods, pink, calyx, and two weeks later, showed a high degree of protection by the treatment; also an increased set of fruit on the sprayed tree.

At Creston the value of spraying was demonstrated.

Fire blight, though prevalent in the Okangan during 1917, did not become epidemic, though the sporadic and somewhat later primary appearances led to numerous secondary infections subsequently. The trouble is largely explained by the absence of skilled labor to remove the early dormant cankers. At Grand Forks the injury was greater.

Potato late blight, certain Fusarium rots, and other internal diseases caused much loss to potato growers in certain regions during the previous two seasons. Silver scurf (*Spondylocladium altrovirens*), while frequent in the coast and island sections, is controllable only by seed selection.

Report of [the] provincial plant pathologist, J. W. EASTHAM (*Brit. Columbia Dept. Agr. Ann. Rpt., 13 (1918), pp. 32–36, pl. 1*).—Potato leaf roll appeared in 1918 in the vicinity of Vancouver. White pine blister rust has not yet been found in British Columbia, though it is thought that the western pine, *Pinus monticola*, might prove more susceptible than the eastern species, *P. strobus*, if the disease were once introduced. Apple anthracnose control was studied in experiments which are described. The effects of the previous year's spraying were of practical value in 1917.

Apple scab data obtained from tests during three years have offered a basis for successful work in the direction of control. Late rains (about the middle of August) introduced a new factor during 1917, and the late spray that year appeared valuable, whereas in previous years it had appeared superfluous.

Potato disease was made the subject of organized study, including different localities. Late blight did not appear until August. The single spraying afforded a considerable degree of protection. Proper dates for spraying can not be determined in advance.

Weather conditions were important as regards diseases of other plants besides potato. The heavy rains about the middle of August, following a hot, dry season, resulted in much apple scab, fruit pit, and a very general condition of premature breakdown in the tissue of apples. Peculiar cases of rotting are noted.

[Plant diseases, British Columbia], M. S. MIDDLETON (*Brit. Columbia Dept. Agr. Ann. Rpt., 12 (1917), pp. 20, 21*).—In this portion of a report including insect pests, it is stated that in the main the fire blight situation was improved during 1917, and the same is true regarding apple and pear scab. Apple anthracnose has become serious in the moist, coast sections. Peach mildew and leaf curl were not serious. Late blight of potatoes was extremely prevalent in 1917. Other common diseases were scab, Rhizoctonia, and Fusarium wilt. Among other diseases giving more or less trouble in certain sections were raspberry anthracnose, strawberry-leaf spot, and mildew.

Experimental work [on plant disease and insect control], B. HOY (*Brit. Columbia Dept. Agr. Ann. Rpt., 12 (1917), pp. 29, 30*).—This is an account dealing with experimental spraying for apple scab and woolly aphis at Kelowna, and peach mildew, leaf curl, and twig borer at Summerland.

Apple scab spraying resulted in clean fruit when lime sulphur was used at 1:30 for the pink spray, 1:35 just after the fall of the petals, and 1:35 2 weeks later. From these and other experiments outlined, it is concluded that the pink, calyx, and one later spray thoroughly applied will control apple scab in any normal season.

Peach mildew and leaf curl were not sufficiently tested, owing to their comparatively slight severity this season. Fire blight inspection showed considerable blossom blight in early spring, but only a few cases of severe infection.

Work connected with insect and fungus pests and their control, F. WATTS (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Dominica, 1918–19, pp.*

13-15).—In addition to a discussion of insects, it is stated that one of the most common and destructive diseases of lime trees in Trinidad is a wither tip due to *Glœosporium limetticolum*. This disease has caused the death of many young nursery plants during the past two years at the St. Clair Station. It attacks limes of all ages and has become epidemic. It is successfully controlled by the use of a 4 : 4 : 50 Bordeaux mixture containing a sticker made up for each gallon of water by adding 2 lbs. resin and 1 lb. washing soda crystals. This is mixed and boiled (about one hour) until the preparation is of a clear brown color, spreading and adhering to the glossy leaf surfaces.

Efforts made to prevent the introduction of serious plant pests and diseases into St. Lucia, and the spreading therein, A. J. Brooks (*[Imp. Dept. Agr. West Indies], Agr. Dept. St. Lucia Leaflet 17* (*1919*), *pp. 12*).—The plant protective measures here outlined with discussion include efforts to prevent the introduction and spreading of plant diseases and pests and to eradicate them when once introduced into the island of St. Lucia.

Mycology [and plant diseases, Madras, India, 1918-19], R. C. Wood (*Rpt. Dept. Agr. Madras, 1918-19, pp. 8, 9*).—Information is given regarding the paddy disease (*Piricularia oryzæ*) noted previously by McRae (E. S. R., 41, p. 749), whose continued investigations are said to have shown that a fungus, apparently similar, attacks *Panicum repens*, a grass which is common among the rice fields; also that this fungus inoculated into wheat and barley produces the disease.

Phytophthora meadii caused less disease of rubber trees than previously, owing supposedly to unusual monsoon conditions. Another rubber disease has appeared, resembling brown bast as known elsewhere. No causative organism has been discovered.

Bud rot of palmyras (*Pythium palmivorum*) has been reduced, supposedly to the lowest possible point. Inoculation experiments with bleeding disease of the palm (*Thielaviopsis ethaceticus*), show that the attack occurs only at wounds, and that cauterizing and disinfecting an affected area offers good hope for a permanent cure.

Mildew (*Oïdium tuckeri*) and bird's-eye disease (*Glœosporium ampelophagum*) of grape were reduced by spraying. The Mahali disease of areca nuts was not so extensively treated, the season being unfavorable to the development of this disease. The advantage of treating cereal seed for smut was not very marked.

Mycology [Ceylon, 1918], T. Petch (*Ceylon Admin. Rpts. Sect. IV, Rpt. Dir. Agr., 1918, pp. 10, 11*).—In a report on the work of the botanical and mycological division, it is stated that the consignments of diseased plants sent in for examination included Hevea, tea, coconut, and certain food and miscellaneous plants.

Vegetable pathology [Queensland], H. Tryon (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1915-16, pp. 51-55*).—This report includes brief notes on diseases affecting a wide range of economic plants.

Vegetable pathology [agricultural crops, Queensland], H. Tryon (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1917-18, pp. 45-47*).—This report is of the same general character as that noted above and previously (E. S. R., 39, p. 850).

Annual report of the government microbiologist, H. M. Nicholls (*Tasmania Agr. and Stock Dept. Rpt. 1917-18, pp. 13-16*).—Black spot of apple caused much less injury on the whole than during the preceding season. It is concluded that the best results as regards control are obtained by applying Bordeaux mixture thoroughly, first in the spring as the flower buds begin to unfold and lime sulphur after the first fruit has set. Powdery mildew in most places stands next to black spot as regards orchard injury. These two diseases are often complicated by the presence of the red spider. Leaf spot (*Sphæropsis malorum*) has increased very materially during recent years. The Irish blight of potato was materially checked by the dry summer. The fungus is carried over in the seed potatoes. Potato wilt (*Fusarium solani*) is very common in Tasmania, causing considerable loss during some seasons. Crown gall exists in the State, having been introduced supposedly on trees from Victoria.

Proclamation regarding control of grain smut (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 17 (1919), No. 7–8, pp. 77–81, figs. 5*).—This information was embodied in a poster and deals with smuts of wheat, barley, and oats.

Treatment of wheat rust, E. Foex (*Bul. Agr. Algérie, Tunisie, Maroc, 2. ser., 25 (1919), No. 12, pp. 292–294*).—This gives the substance of a leaflet of information bearing upon two methods (which are outlined) for the treatment of seed wheat grain to prevent smut.

A practical method of fighting wheat rust, D. B. Swingle (*Bien. Rpt. Mont. Bd. Hort., 10 (1917–18), pp. 74–79, figs. 4*).—A brief statement of the history of wheat rust, its practical control in Denmark, and the difficulty of its control by eradication of barberry, especially in the southern parts of the United States, is followed by an account of the establishment of a barberry eradication district extending from Michigan to Montana, inclusive, and from Minnesota to Illinois, inclusive. In Montana this rust attacks both purple- and green-leaved barberry, though the Japanese species is immune there as elsewhere.

Studies on stem rust in Wisconsin, 1918, J. G. Dickson and A. G. Johnson (*Wis. Dept. Agr. Bul. 20 (1918), pp. 56–60, fig. 1*).—During the spring and summer of 1918, an intensive study was made of the stem rust problem in Wisconsin, the chief object being to accumulate more detailed and definite information on the rôle of the barberry (*Berberis vulgaris*) in the spread of the stem rust of grain (*Puccinia graminis*). A brief account is here given of this work, which was carried on in cooperation with the Bureau of Plant Industry, U. S. Department of Agriculture.

The urediniospores which had formed on the new fall shoots of perennial grasses and winter grains retained their ability to grow until the winter covering of snow had disappeared, about March 5, after which time their viability rapidly decreased, no viable spores being found after March 30. Germination in February averaged less than 3 per cent, and in March less than 1 per cent.

An account with graphical illustration shows that degree of infection decreased rather uniformly with distance measured northeast from a barberry hedge, ranging from 100 per cent at 15 ft. to 10 per cent at 200 ft., 1 per cent at 300 ft., and 0.5 per cent at 400 ft. It is stated that the three strains of grain stem rust in Wisconsin go also to such grasses as wild barley, quack grass, orchard grass, and wild rye. All these strains will rust the barberry, which however is able thereafter to rust only the appropriate special hosts. New grain stem rust development was not found in advance of the time when the infection could not have come from infections on barberry.

The eradication of barberry in Wisconsin, C. P. Norgord (*Wis. Dept. Agr. Bul. 20 (1918), pp. 44–56, figs. 5*).—This is a general account of barberry as a host of the wheat black stem rust fungus, and of its early and recent history in Wisconsin as regards location and attempts to eradicate the fungus, particularly in relation with barberry growing wild.

A preliminary note concerning a serious nematode disease of red clover in the Northwestern States, R. H. Smith (*Jour. Econ. Ent., 12 (1919), No. 6, pp. 460–462*).—The widespread destructiveness of an affection of red clover in

Idaho during the autumn and early winter led to an investigation by the author in which the well-known stem and bulb nematode of Europe (*Tylenchus dipsaci* [*devastatrix*]) was found responsible.

The indications are that it has been present in southern Idaho for several years, and that it is rapidly increasing in its destructiveness. During the spring of 1919 several hundred acres of red clover had to be plowed up, while a large percentage of the fields left was quite badly affected. This nematode was first recorded from North America by Bessey, who found it damaging a field of rye at Edgerton, Kans., in 1907. It was next discovered in 1913 at Bellingham, Wash., where it caused serious injury to hyacinths, and in 1915 it was found injuring red clover at Redmond, Oreg.

"The nematodes appear to enter the clover plants at the surface of the ground, first working into the stipules of the leaves which surround the developing stems and later entering the stems. The infested parts near the ground become enlarged, spongy, and finally turn brown and rot off. The worms also occur higher up in the stems and in the leaves and branches, where they cause distortions and enlargements. The malforming of plants is most pronounced in autumn and early winter. During the summer the foliage of affected plants usually has an unhealthy, striped-yellow appearance, and the plants as a whole are more or less stunted.

"The death of diseased plants is hastened in the greater number of cases by the work of secondary agents, the most important of which seem to be the root mite (*Rhizoglyphus rhizophagus*), the larvæ of the mycetophilid (*Sciara trifolii*), and the larvæ of *Sitones hispidulus*, a snout beetle that is common in clover fields in the Northwest. The greater injury results to clover fields the second year or longer after seeding, when both the nematodes and the insects are found to be more abundant. Several fields have been observed, however, which had to be plowed up the first year after seeding."

The potato disease problem, C. R. ORTON (*Potato Mag., 2 (1920), No. 7, pp. 10–14, 36, figs. 9*).—Methods and means of control are pointed out for the several potato diseases named as important.

The ring or bangadi disease of potato (*Dept. Agr. Bombay Leaflet 8 (1918), pp. 3*).—It is stated that in nearly all of the potato growing tracts of the Deccan and the Bombay Karnatak one of the most important diseases is the ring disease known as bangadi or chakri. This leaflet describes the symptoms of the disease and preventive methods.

The disease is recognized by the sudden wilting of some part, extending later to the whole plant. Dead plants or patches are common. The cut potato shows a brown ring from which may be squeezed a creamy, yellow liquid, containing the causal bacteria.

The disease is carried by the seed tubers, which if badly infected may rot without sprouting, or may produce plants which will probably wither sooner or later, and by which the disease may be propagated. Diseased tubers may rot in storage and extend the disease to others.

Prevention requires the use of only disease-free seed, obtained by disinfection of knives for cutting up the seed tubers, draining the low places in the field, proper storage, and adequate inspection.

Fusarium blight of the soy bean and the relation of various factors to infection, R. O. CROMWELL (*Nebraska Sta. Research Bul. 14 (1919), pp. 5–43, figs. 5*).—In a previous publication (E. S. R., 37, p. 50), the author described the disease of soy beans due to *Fusarium tracheiphilum*. In the present publication, an account is given of additional studies on the soy bean blight to determine the effect of various factors on the amount and severity of the disease.

morphological and cultural characters of the organism, an account is given of experiments on the relation of various soil factors to infection of soy beans, including the influence of soil types, acidity and alkalinity, nematodes, soil temperature, and influence of other organisms. The physical structure and acidity of soils under natural conditions were not limiting factors in infection, but acidity under certain conditions was found to have some influence. Infection is said to occur through the roots, but nematodes did not increase the percentage of blight materially. Other organisms, such as Rhizoctonia and *Sclerotium rolfsii*, and other root injuries are believed to increase materially the percentage of diseased plants in the field.

An investigation was made on the susceptibility of different varieties of soy beans, and the Black Eyebrow variety was found to show some evidence of resistance. The Brown variety, while not resistant, appeared tolerant and developed remarkably in spite of numerous fungus filaments and nematodes within the roots. Fifteen other varieties tested were found to be similarly affected. Velvet beans were not found subject to attack of this organism.

The mottling or yellow stripe disease of sugar cane, J. A. Stevenson (*Jour. Dept. Agr. and Labor Porto Rico, 3* (*1919*), *No. 3, pp. 3–76, pls. 3, figs.* 7).—Earlier reports (E. S. R., 39, p. 53; 42, p. 644) regarding the disease of sugar cane which has been raging in Porto Rico unchecked for several years are followed up with a systematic account of studies on this trouble, for which the descriptive name mottling disease is preferred.

The mottling disease first appeared in the northwest section of the island, and spread rapidly eastward until only a portion of the east and southeast coast regions remain uninfected. Indications point to a continued progress by the disease. Upland fields have as a rule been most severely attacked. Losses to date are estimated at $2,500,000. These appear chiefly in tonnage, though diseased canes introduce also difficulties in manipulation at the mill. Apparently the trouble spreads by other means than by infected planting material. The disease has been found on several varieties in Santo Domingo, though it is not yet epidemic there. One infected area is reported from St. Croix.

Though Otaheite was the variety first seriously attacked, Rayada and other native types have succumbed in succeeding seasons. The numerous foreign varieties (mostly seedlings) vary greatly in this respect, ranging from great susceptibility to very promising resistance. Some station seedlings are also quite promising.

The disease is characterized by a mottling of the leaves, followed in advanced stages by a stunting of the entire stool and the presence of gray, sunken lesions on the stalks. The appearance of the mottling varies greatly with the variety. Approximately a three years' progressive course is followed, ending in the death of the stool.

No other hosts are yet known. No direct relation has been established between the disease and nature of soils, years in cane, methods of preparing the land, drainage, or other cultural features. No direct influence was demonstrated in case of fertilizers, liming, seed treatment, manner of disposing of trash, or moisture content of the soil. An accumulative effect in successive ratoon crops is apparent. The disease has not been transmitted artificially. Chemical tests of the juice do not show any abnormal glucose ration or any constant difference between the juice of normal and that of diseased canes.

Fungi and bacteria are not known to be associated in any way as causal agents, either on leaves or stalks. The cankers appear to be a result of the general weakening of the plant, though fungi may invade them later. The infectious principle is present in all parts of the diseased plants. The disease is transmitted by seed pieces, and also apparently by some other means. Infection appears to be aerial, and not to persist in the soil. Certain insects may be carriers. The disease is considered to be an infectious chlorosis due to a virus or ultramicroscopic organism. The disease and its manifestations are discussed in view of what is known regarding related phenomena.

Report on an investigation of froghopper pest and diseases of sugar cane in Trinidad, W. NOWELL (*Bul. Dept. Agr. Trinidad and Tobago, 18* [*1919*], *No. 2, pp. 57–69*).—The main object of the present report is to contribute to the understanding of the cane trouble now widely known as blight and correlated with root disease and with widely varying degrees of injury to standing canes. Both the attack and its persistence are said to depend upon a condition of weakness or debility in the cane, that is, root disease presupposes unfavorable conditions.

Fungi related to root disease are mainly two, belonging to the Marasmius group (usually *M. sacchari*), and to the Odontia group (*O. sacchari* and *O. saccharicola*). The disease is apparently much more common in association with the latter type. The parisitism of both requires investigation. Depressed vitality on the part of the cane favors injurious development by the root fungus, which enters the root tips, distorting, checking, and finally killing them. It also envelops the young leaf shoots at various stages, cementing the sheaths and in severe cases infesting internally the buds, shoots, and underground connections of the stock, and to some extent the leaves of the developed canes. The general effect is that of water shortage. This is due to interference with absorption and conduction, and such interference is delayed or decreased in situations favoring good root development and deep penetration by the roots. The planting and cultivation customary in these regions are frequently such as to favor access of the fungi left by the old canes. Climatic conditions in Trinidad, however, are so favorable to cane as partly to offset cultural disadvantages.

Froghopper infestaton may be connected with the trouble above discussed through the reduction of vigor in plants, but in many examples seen it is considered as possible that no effective part was taken by the froghopper insects.

Remedial plans suggested include treatment of sets with Bordeaux mixture.

The relation of root fungus to froghopper blight of sugar cane in Trinidad, C. B. WILLIAMS (*Bul. Dept. Agr. Trinidad and Tobago, 18* [*1919*], *No. 2, pp. 52–56*).—In connection with the above report by Nowell, the present author gives a provisional and incomplete account of his own experiences and observations of froghopper blight of sugar cane, following a summary of the history of the blight and a view of its connection with the presence of froghopper and the root fungus (Marasmius).

The general conclusions of the present author agree with those of Nowell. The view is expressed that 50 per cent of the damage at present caused by blight could be prevented without any decrease in the number of froghoppers.

Sugar cane varieties and froghopper blight in Trinidad, C. B. WILLIAMS (*Bul. Dept. Agr. Trinidad and Tobago, 18* [*1919*], *No. 2, pp. 70–83*).—The question of varieties resistant to froghopper blight having come into prominence in the course of the observations and work above noted, the author has collected notes and observations which are here particularized as covering more than 50 cane varieties. From this work he concludes that no variety of cane at present grown in Trinidad is immune to the blight, though Uba and Badilla are measurably resistant, and recently introduced varieties seem to justify further experimentation.

Field diseases of the sweet potato in Texas, J. J. TAUBENHAUS (*Texas Sta. Bul. 249* (*1919*), *pp. 3–22, figs. 34*).—After giving directions for treatment of sweet potatoes intended for seed purposes, the author describes the more common field diseases of sweet potatoes in Texas, and suggests methods for their control.

Experimental work [with apple scab and with fire blight of apple], P. E. FRENCH (*Brit. Columbia Dept. Agr. Ann. Rpt., 12 (1917), pp. 24–28*).—Spraying tests showed that apples can be produced commercially free from scab. At Salmon Arm, the best results for the money expended were obtained from three applications with lime sulphur, the pink and the calyx spray and another 4 weeks later. In the Vernon district two sprays were sufficient, these being the calyx (the more important) and the one 4 weeks later.

To the above locality tests were added material tests, the average results of the 2 years showing clearly the superiority of lime sulphur over atomic sulphur and Bordeaux. The latter caused much russeting of the fruit, but the former showed a 20 per cent decrease in yield attributed to scab.

Experiments testing the value of lime sulphur against apple scab at different strengths (1:30 to 1:50), showed the weaker strengths to give practically the same results as the stronger ones which have been usually applied.

On the whole, apple scab caused less damage in 1917 than in the previous year, owing to the season and to the more efficient methods employed.

Fire blight, which is scattered sparsely throughout the Vernon and Armstrong districts, occurring mostly on old limbs of such varieties as Spitzenberg, has been located for the most part, and the situation offers promise of early control.

Red cedar trees and cedar rust, R. E. MARSHALL and F. D. FROMME (*Va. Polytech. Inst. Ext. Bul. 39 (1920), pp. 8, fig. 1*).—The results are given of a cedar rust survey of Augusta County, Va., in which 113 orchards containing a total of 72,235 apple trees of the York Imperial variety were examined for severity of rust infection on the foliage, amount of defoliation, size of fruits, vigor of trees, and number and location of cedars. The relation between cedar trees and cedar rust in the orchards is shown in a very conclusive way, proximity to cedar trees being reflected in the greatly increased number of infections on this susceptible variety of apple.

Treatment for anthracnose, L. RAVAZ (*Prog. Agr. et Vitic. (Ed. l'Est-Centre), 41 (1920), No. 5, pp. 103–104*).—Treatments locally effective against grape anthracnose are given. The first of these is made up of iron sulphate 30 to 40 kg. and suphuric acid 1 to 2 kg. in 100 liters of water; the second of 10 kg. sulphuric acid in 100 liters of water.

Treatment of chlorosis [in vines] in full vegetation, L. DEGRULLY (*Prog. Agr. et Vitic. (Ed. l'Est-Centre), 40 (1919), No. 22, pp. 506, 507*).—A report from Donnadieu is quoted, stating that iron sulphate at 0.1 per cent strength is a certain preventive of chlorosis, and that it is advisable to add iron sulphate in all spraying operations where an acid spray is applied to grapevines.

Autumnal treatment for chlorosis, L. RAVAZ (*Prog. Agr. et Vitic. (Ed. l'Est-Centre), 40 (1919), No. 42, pp. 361–363*).—Discussion is given of the prevalence during 1918 of conditions favorable to the development of chlorosis in grapevines, and of measures taken to prevent or forestall this trouble by applications, mainly of iron compounds, capable of utilization by the plant.

Red ring disease of coconuts, W. NOWELL (*Agr. News [Barbados], 18 (1919), No. 460, p. 398*).—In a report read before the Board of Agriculture of Trinidad, in October, 1919, the author states that the connection of the so-called root disease of coconut with the presence of a nematode has been abundantly confirmed. A description of this nematode, said to be a new species, under the name *Aphelenchus cocophila*, is expected to be given by Cobb in a forthcoming number of this publication. It is now known that the presence of this organism in the roots is secondary, and that the red zone of the stem is a breeding ground for the nematode, which thence extends to roots and to leaves, both mature and semimature, and even to the youngest rudimentary leaves in the bud centers. No alternate host of the nematode is yet known. The disease appears typically first in widely separated cases as the trees approach the bearing age, and extends from these centers until infestation may approach 30 per cent. Injury does not appear to be a prerequisite to infection by the organism.

The fungus diseases of the tea leaf, A. C. TUNSTALL and S. C. BOSE (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 3* (*1919*), *pp. 82–89, pls. 3, figs. 4*).—These investigations on fungus diseases of tea leaves are still in progress, and are to be published in pamphlet form when completed. The present contribution is confined to characters of the normal tea leaf.

Red rust, A. C. TUNSTALL (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 3* (*1919*), *pp. 90–94*).—This is a brief account of tea red rust (*Cephaleuros virescens, C. mycoidea*), its forms, conditions of attack, and control measures.

Black canker or rot of chestnut, B. PEYRONEL (*Staz. Sper. Agr. Ital., 52* (*1919*), *No. 1–2, pp. 21–41, pls. 4*).—Reporting further on a study previously noted (E. S. R., 37, p. 657), the author notes a fungus found in connection with black canker of chestnut. This is considered a species of a new genus. Both are technically described. The new form is named *Rhacodiella castaneæ.*

The occurrence of oak mildew on beech in Britain, A. D. COTTON (*Brit. Mycol. Soc. Trans., 6* (*1918*), *pt. 2, pp. 198–200*).—This was observed by the author near Sevenoaks, Kent, in July, 1918. It occurred on shoots springing from stumps of old trees which had been cut down, the beech being infected in some instances directly from spores produced by the oak. Apparently in such cases, only very young leaves are susceptible.

The present status of the white pine blister rust control in Montana, 1918, G. A. ROOT (*Bien. Rpt. Mont. Bd. Hort., 10* (*1917–18*), *pp. 69–73, figs. 3*).—A brief account is given of the white-pine blister rust, though it is stated that no record has yet been made of its presence in Montana.

The white pine blister rust (*Concord, N. H.; Forestry Dept., 1919, pp. 4, figs. 11*).—This pamphlet, giving a popularized account of the white pine blister rust in its two stages, its dissemination, and results, sketches also the development and work of the New Hampshire Forestry Commission since the inception of it work in 1917 in connection with the Bureau of Plant Industry, U. S. Department of Agriculture.

White pine blister rust [in Wisconsin], C. P. NORGORD (*Wis. Dept. Agr. Bul. 20* (*1918*), *pp. 16–17, 40–43, figs. 2*).—Active work on white pine blister rust in cooperation with the U. S. Department of Agriculture has shown that this disease reached Wisconsin earlier than was formerly thought, as what appeared to be a small infection in Polk County proved to be really a very wide infection, extending to nine additional counties. The most dangerous centers are three in number, namely, Falun (Burnett County), Lewis (Polk County), and Rice Lake (Barron County), in all of which pines are seriously attacked.

An account is given of inspection and other work during 1917 and 1918, with discussion of measures in force or in prospect.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

An apparent effect of winter inactivity upon distribution of mammals, H. H. T. JACKSON (*Jour. Mammalogy, 1* (*1920*), *No. 2, pp. 58–64, fig. 1*).

Rodent mountaineers, W. P. TAYLOR (*Jour. Mammalogy, 1* (*1920*), *No. 2, pp. 93, 94*).

A new subspecies of beaver from North Dakota, V. Bailey (*Jour. Mammalogy, 1 (1919), No. 1, pp. 31, 32*).

Notes on the fox squirrels of southeastern United States, with description of a new form from Florida, A. H. Howell (*Jour. Mammalogy, 1 (1919), No. 1, pp. 36–38*).

The Florida spotted skunk as an acrobat, A. H. Howell (*Jour. Mammalogy, 1 (1920), No. 2, p. 88*).

The wood rat as a collector, W. P. Taylor (*Jour. Mammalogy, 1 (1920), No. 2, pp. 91, 92*).

The Florida water rat (Neofiber alleni) in Okefinokee Swamp, Ga., F. Harper (*Jour. Mammalogy, 1 (1920), No. 2, pp. 65, 66, pl. 1*).

Description of a new race of the Florida water rat (Neofiber alleni), A. H. Howell (*Jour. Mammalogy, 1 (1920), No. 2, pp. 79, 80*).

Identity of the bean mouse of Lewis and Clark, V. Bailey (*Jour. Mammology, 1 (1920), No. 2, pp. 70–72*).

The Georgian bat, Pipistrellus subflavus, in Wisconsin, H. H. T. Jackson (*Jour. Mammalogy, 1 (1919), No. 1, p. 38*).

Birds and the war, H. S. Gladstone (*[London]: Skeffington & Son, Ltd., 1919, pp. XVIII+169, pls. 17*).—The several chapters of this work deal with the utility and economy of birds in the war, sufferings of birds in the war, behavior of birds in the war zones, and the effect of the war on birds. It concludes with a list of the ornithologists killed in the war.

Insects attacking sugar cane in the United States, T. E. Holloway and U. C. Loftin (*Jour. Econ. Ent., 12 (1919), No. 6, pp. 448–450*).—This is an annotated list of 18 important enemies of sugar cane.

Common orchard and nursery pests and their control, G. C. Starcher, W. E. Hinds, and G. L. Peltier (*Ann. Rpt. Commr. Agr. and Indus. [Ala.], 1918, pp. 97–129, figs. 8*).—A popular summary of information.

Principal insects and plant diseases attacking the stems of currants and gooseberry plants, H. C. Severin (*Ann. Rpt. State Ent. S. Dak., 10 (1919), pp. 16–36, pl. 1, figs. 11*).—The insects here noted are the American currant borer (*Psenocerus supernotatus*), imported currant borer (*Sesia tipuliformis*), European fruit tree lecanium (*Lecanium corni*), oyster-shell scale, Putnam's scale, currant aphis, imported currant worm, oblique-banded leaf roller (*Archips rosaceana*), red spider (*Tetranychus telarius*), and span worm (*Cymatophora ribearia*).

Eleventh annual report of the Quebec Society for the Protection of Plants from Insects and Fungus Diseases, 1918–19 (*Ann. Rpt. Quebec Soc. Protect. Plants [etc.], 11 (1918–19), pp. 84, pls. 11*).—Among the papers here presented are the following: Methods of Studying Economical Insects, by W. Lochhead (pp. 12–17); The Sparrow Question, by P. Fontanel (pp. 20–24); The Pepper and Salt Moth (*Amphidasis cognataria*), by J. C. Chapais (pp. 25, 26); Dusting and Spraying Suggestions for Quebec, by C. E. Petch (pp. 27, 28); The Present Situation of the Brown-tail Moth in Eastern Canada, by L. S. McLaine (pp. 29–32); Some Problems in Botany and Entomology, by V. A. Huard (pp. 33, 34); The Imported Alder Leaf Miner [*Kaliosysphinga dohrnii*], by C. B. Hutchings (pp. 35–37); A Canadian Bee, *Colletes inæqualis*, by L. M. Stöhr (pp. 38–45); Some Insect Injuries in Woodlots [*Pityokteines sparsus, Pissodes dubius*], by J. M. Swaine (pp. 46–48); Efficiency Factors in Potato Spraying, by W. H. Rankin (pp. 49–55); How the Protection of Plants has Progressed in Quebec, by G. Maheux (pp. 56–58); and Insect Carriers of Plant Diseases, by E. M. DuPorte (pp. 59–65).

The beneficial action of lime in lime-sulphur and lead arsenate combination spray, R. H. Robinson (*Jour. Econ. Ent., 12 (1919), No. 6, pp. 429–*

433).—This is a report of investigations by the associate chemist of the Oregon Experiment Station.

The data presented indicate that there is a pronounced detrimental chemical reaction between lime-sulphur and lead hydrogen arsenate when mixed for a combination spray. By the addition of lime at the rate of about 10 lbs. to 100 gal. of lime-sulphur previous to adding the lead arsenate, this reaction can be prevented to a certain extent.

Lace bug on hawthorn, Corythucha bellula (Tingitidæ, Hemiptera), W. H. WELLHOUSE (*Jour. Econ. Ent., 12 (1919), No. 6, pp. 441–446, figs. 2*).—This tingitid, originally found to occur in abundance in 1917 on several Cratægus trees near Tiffin, Ohio, has been observed during the past year in several localities about Ithaca, N. Y. It appears to confine its attack to those species of Cratægus which have an abundance of pubescene along the veins on the lower sides of the leaves, having been found in great abundance on *C. neofluvialis* and to some extent on *C. albicans* and *C. punctata*. The leaves of *C. neofluvialis* were so discolored by its attack that by the end of July they attracted attention several hundred yards away. By the middle of August the leaves were falling and by September 1 the branches were bare, with the result that no fruit matured on the infested trees. The injury is caused by the nymphs and adults puncturing the undersurface of the leaf and sucking the sap, causing at first a mottled effect due to the pale areas around the feeding punctures while later the leaf turns brown and falls to the ground.

There are two generations of the insect a year at Ithaca. The first brood hatched out in July from eggs laid in late May and June, the nymphs becoming mature in from 20 to 25 days. The second brood eggs are laid in late July and August, and the adults appear in late August and September. The winter is passed by the adults of the second brood among the fallen leaves and in crevices of the bark. The eggs are laid on the undersurface of the leaf in the axils formed by the midrib and its lateral branches. Eggs laid June 2 hatched in 37 and 38 days, while eggs of the second brood laid July 29 and 30 hatched 17 and 18 days later. Upon hatching out, the nymphs feed in colonies near the eggshells. They molt five times, feeding from 3 to 6 days between molts, the earlier stages requiring 3 or 4 days and the later ones 5 or 6 days. During the fifth stage the nymphs wander about more freely over the leaf and sometimes go to adjoining leaves. Descriptions are given of the five stages.

As regards control measures, it is pointed out that should the second brood nymphs become too numerous on ornamental plantings, they may be controlled by using one of the nicotin sprays commonly used against leaf bugs on apple.

The life history and early stages of Macropsis virescens graminea, a poplar leaf-hopper in New Jersey, H. B. WEISS and E. L. DICKERSON (*Jour. Econ. Ent., 12 (1919), No. 6, pp. 437–440*).—This is a report of observations covering a period of several years upon *M. virescens graminea*, a European insect which was fairly abundant on Lombardy poplars in a nursery at Irvington, N. J.

The winter is passed in the egg stage, the eggs being found in 2-year-old wood, usually in the neighborhood of the buds near the end of the growth, although some are found in the twig tissue between the sets of buds. They are inserted singly on their sides just beneath the bark tissue, and the bark over the egg is raised, showing the contour in a somewhat irregular fashion. Hatching takes place during the first week in May at a time when the leaves are small, and by the last few days in May and the first part of June the first adults appear. The greater part of the adults, however, appear about the middle of June, and from then on until the middle of July and later they can be found scattered over the trees.

Oviposition takes place during the last of June and first part of July. There are five nymphal stages, and the combined time necessary for them to mature is about one month. The early stages are found on the young unfolding leaves and leaf petioles, usually at the bases. As they become older they disperse and move to the stems where they rest in the axils of the leaves or occasionally on the petioles. Technical descriptions are given of the egg, five nymphal stages, and the adult.

The species is said to have been recorded by Osborn as occurring at Salem, N. Y., and at Orono, Me. Specimens on elm in a nursery at Rutherford, N. J., were also examined by the author.

The Houghton gooseberry aphis, A. C. Baker (*Jour. Econ. Ent.*, *12* (*1919*), *No. 6*, *pp. 433–437*).—*Aphis houghtonensis*, described by Troop in 1906 from specimens attacking the gooseberry at Indianapolis, has been studied by the author, specimens having been received from Benton Harbor, Mich., in 1916, where it was injurious to the Houghton gooseberries.

Rearings were made and descriptions are given of alate viviparous, intermediate, and summer apterous forms and of the sexes. The eggs, which apparently are deposited upon the bark under the loose folds that extend down the twigs, about the bases of the buds, and occasionally upon the thorns, hatch the middle of April. As soon as the young stem mothers are hatched, they wander to the young opening leaves to feed and place themselves either on the undersurface of the leaves or upon the petioles. Thus attacked, the leaves immediately begin to curl and soon inclose the stem mothers and the young they may have produced. The alate viviparous form was found to occur in every generation in which specimens were reared from the second onward. All specimens of the alate viviparous form were placed upon gooseberry died without reproducing, indicating that an alternate host is necessary, at least to certain individuals. The first summer apterous form appeared on May 9, when young were produced by adult stem mothers. They attacked the leaves in the same manner as did the stem mothers, causing many of them to roll very tightly so that great difficulty was experienced in examining the insects. The sexes appear upon the bushes in September and October, and eggs are laid as early as the first week in October.

Lucerne aphis (*Dept. Agr. Bombay Leaflet 4* (*1919*), *pp. 3*, *pl. 1*).—A brief account of this plant louse, which is a source of considerable injury.

Experiments with steam disinfectors in destroying lice in clothing, R. H. Hutchison (*Jour. Parasitol.*, *6* (*1919*), *No. 2*, *pp. 65–78*, *fig. 1*).—"If the penetration of steam is sufficient to produce a temperature of 75° C. (167° F.) in the center of a barracks bag (or other load of infected goods) all eggs and active stages of body lice will be destroyed. This conclusion, based on the above practical tests, agrees very well with laboratory experiments on fatal temperatures. Nuttall [E. S. R., 39, p. 864] has shown that nits are killed in one minute at 70° in dry heat, and in 10 seconds at 70° moist heat.

"If the disinfectors are operated efficiently on the time schedule now employed (viz., a 10-inch preliminary vacuum; 15 lbs. steam pressure for 15 minutes, reckoned from the time the steam is turned on; followed by a 10-inch drying vacuum), the requisite temperature (75°) is attained in every case. By efficient operation is meant (1) the maintenance of a full head of steam so that the 15 lbs. pressure in the disinfector is produced within 5 minutes, thus allowing at least 10 minutes for exposure; (2) overloading must be guarded against; (3) the individual bundles must not be rolled too tightly.

"Little, if any, shrinkage of woolen goods is caused by this treatment. There is, of course, some wrinkling, but these wrinkles are not permanent but may be remedied by pressing."

The coconut butterfly (Brassolis isthmia) on banana, J. Zetek (*Jour. Econ. Ent., 12 (1919), No. 6, p. 465*).—The author reports upon the occurrence of the larvæ of *B. isthmia* on banana trees at Panama City. An account of this pest upon coconut palms by Dunn has previously been noted (E. S. R., 38, p. 58).

Some lepidopterous pests new to sugar cane in Queensland, E. Jarvis (*Bur. Sugar Expt. Stas. Queensland, Div. Ent. Bul. 9 (1920), pp. 16, pl. 1*).—The author records the presence in north Queensland cane fields of Lepidoptera not included in the bulletin previously noted (E. S. R., 36, p. 654). The species considered are *Cirphis loreyi, Mocis frugalis, Melanitis leda, Padraona hypomoloma*, an undetermined bag moth, *Anthela acuta*, and *Ophiusa melicerte*. The author lists the species of Noctuidæ, 27 in number, recorded from various parts of the world as being more or less injurious to sugar cane.

A new genus and species of oecophorid moths from Japan, C. Heinrich (*Proc. Ent. Soc. Wash., 22 (1920), No. 3, pp. 43–50, figs. 14*).—A species reared from stored grain at Yokohama, Japan, is described as *Santuzza kuwanii* n. g. and n. sp.

Experimental transfer of Weil's disease by the stable fly, P. Uhlenhuth and P. Kuhn (*Ztschr. Hyg. u. Infektionskrank., 84 (1917), pp. 517–540; abs. in Abs. Bact., 2 (1918), No. 5, p. 283*).—The authors have succeeded in transmitting infectious jaundice in guinea pigs through the bites of stable flies. Of 9 attempts, 4 were certain, 3 doubtful, and 2 clearly negative.

The swarming of anopheline mosquitoes, C. S. Banks (*Philippine Jour. Sci., 15 (1919), No. 3, pp. 283–288*).—This paper relates to observations of *Myzomyia rossii*.

Investigation of control measures for white grubs affecting sugar cane in Queensland, J. F. Illingworth (*Jour. Econ. Ent., 12 (1919), No. 6, pp. 451–455*).—This report of investigations of control measures conducted by the author in Queensland is based upon work previously noted (E. S. R., 42, p. 545).

New American Cleridae, with note on the synonymy of Micropterus Chevr. (Coleoptera), E. A. Chapin (*Proc. Ent. Soc. Wash., 22 (1920), No. 3, pp. 50–54*).

A parasite of dermestid beetles in entomological collections, T. D. A. Cockerell (*Canad. Ent., 52 (1920), No. 2, p. 34*).—Under the name *Laelius utilis* the author describes a new bethylid parasite reared from anthrenid larvæ.

A weevil attacking agave, H. A. Ballou (*Agr. News [Barbados], 19 (1920), No. 462, p. 10*).—A weevil which attacks agave in Curaçao has been identified as *Scyphophorus acupunctatus*, an insect which is native of and abundant in Mexico. While originating in Mexico and Central America, it now occurs in Curaçao, Haiti, and Cuba in the western Tropics and in East Africa and Java in the East. This weevil occurs in the "bull end" of the flower pole in *Agave vivipara*, but does not appear to attack *A. sisalana*. The larvæ and adults occur in great numbers in the stem and leaf bases of plants of *A. frankeera* that have not yet formed a pole.

Notes on the bronze apple-tree weevil, G. F. Moznette (*Jour. Econ. Ent., 12 (1919), No. 6, pp. 426–429, pl. 1*).—The bronze apple-tree weevil (*Magdalis ænescens*), first described in 1876 by LeConte from specimens collected in Oregon, occurs in British Columbia, Washington, and Oregon and is prevalent throughout the Willamette Valley in Oregon, where observations of the species were made by the author.

It is said to attack trees which have been weakened from some other cause, never having been observed to attack healthy trees. It was observed by the author at McMinnville, Oreg., in 1916 in Italian prune wood sawed from orchard trees, killed apparently through the attacks of the peach and prune root borer (*Ægeria opalescens*).

The eggs are deposited in the bark, eggs laid April 26 having hatched by May 14 and 15. The larvæ live over winter feeding on the bark and on the surface of the wood next to the bark, transforming again in the early part of April. They bore beneath the bark, forming channels that run in every direction. The length of the larval stage is approximately 10 to 11 months, depending on the weather conditions in the spring. Pupation takes place in an oval cell excavated between the wood and bark at the end of the burrow, the pupal stage lasting for 5 days.

Reference is made to its parasitism by *Tetrastichus* sp. and a braconid (*Calyptus* sp.), the parasitism of individuals in limbs examined averaging 50 per cent.

A proctotrypid inquiline with Formica exsectoides, W. M. MANN (*Proc. Ent. Soc. Wash., 22 (1920), No. 3, pp. 59, 60*).

Descriptions of six new wasps, S. A. ROHWER (*Proc. Ent. Soc. Wash., 22 (1920), No. 3, pp. 54–59*).

Studies on the life history and habits of the jointworm flies of the genus Harmolita (Isosoma), with recommendations for control, W. J. PHILLIPS (*U. S. Dept. Bul. 808 (1920), pp. 27, pls. 6, figs. 8*).—This is a report of biological studies and observations of the jointworm flies of the genus Harmolita, formerly known as Isosoma, a revision of which genus by the author and Emery has been previously noted (E. S. R., 41, p. 667).

Six species are classed as attacking grain crops, namely, the wheat jointworm (*H. tritici*), wheat straw worm (*H. grandis*), wheat sheath-gall jointworm (*H. vaginicola*), barley jointworm (*H. hordei*), rye jointworm (*H. secalis*), and rye straw worm (*H. websteri*). Five species are classed as infesting the cultivated grasses, namely, the timothy straw worm (*H. albomaculata*), orchard grass straw worm (*H. dactylicola*), blue-grass jointworm (*H. captiva*), blue-grass straw worm (*H. poae*), and festuca jointworm (*H. festucæ*). Ten species are classed as infesting wild grasses, namely, *H. maculata*, *H. atlantica*, *H. agropyrophila*, *H. elymi*, *H. elymicola*, *H. elymivora*, *H. rufipes*, *H. hesperus*, *H. elymophthora*, and *H. ovata*. All of the above-mentioned species have been reared repeatedly in cages under artificial conditions with the exception of *H. captiva*, *H. rufipes*, *H. hesperus*, *H. elymophthora*, and *H. ovata*. The habits of the remaining eight species recognized by Phillips and Emery are practically unknown. So far as known there is but a single generation each year, with the exception of *H. grandis* and *H. agropyrophila*, which have two.

The adults of *H. tritici*, which is probably the most important species of the genus, emerge in May and oviposit in the stems of growing wheat just about the time the heads begin to appear, the eggs hatching in 10 days. The larvæ mature in about three weeks or a month from date of oviposition, during which time they molt at least three times and possibly four times. The majority of the larvæ pupate in the fall and the remainder in the spring. "A plant infested by the wheat jointworm may not show any external signs of infestation whatever, or the stems may be distorted and have wartlike elevations on them. In any case the stem at the point infested is hard and woody, and where there is no distortion the point of infestation may be readily detected by pinching the stem between the thumb and forefinger. These infested places usually occur above the second or third joint from the root, but may occur above any joint. In badly infested fields several joints may be affected and a large number of plants may fall, thus greatly reducing the yield. It is not necessary, however, that the plants fall or lodge to reduce the yield greatly." It causes serious losses in nearly all the wheat-producing States east of the Mississippi River and in a large part of Missouri, but for some unexplained reason has not as yet invaded the States farther west. It will not develop in any plant other than wheat. A recent Farmers' Bulletin on this species by the author has been noted (E. S. R., 40, p. 170).

H. grandis ranks next to *H. tritici* in importance as an enemy of wheat, and is at present the most important jointworm west of the Mississippi, where it often causes widespread injury. It appears to be the most widely distributed species in the United States, occurring usually in greater or less numbers wherever wheat is grown. It is one of the two species of the genus that has two generations a year, and is the only one known to be dimorphic. The spring form attacks the wheat plants when they are small, the eggs being deposited in the base of the young plant. The affected tiller is totally destroyed by the developing larva and if the plant has not tillered it kills the entire plant. The larva develops within and right at the base of the plant, usually causing the plant to become somewhat bulblike at this point. This generation, which is usually wingless, emerges during March and April in the Eastern and Central States, while in Washington and probably in other Pacific States it emerges in April. The summer form emerges in May and deposits its eggs in the growing wheat plant slightly above the joints, the eggs hatching in about 5 days. The larva rasps the inner walls of the stem, sucks the juices, and subsequently forms a little cell within the joint. "In all the winter wheat areas the effect upon the plant is to cut down the yield of grain, while in places where both spring and winter wheat are sown, often in adjoining fields, the summer form turns its attention to the spring wheat in preference to the older and tougher plants of the winter wheat. Spring wheat is affected very much in the same manner as winter wheat is injured by the first generation (form *minuta*). The summer generation remains in old wheat stubble, pupating in the fall." This species has only been reared from wheat.

H. vaginicola deposits eggs in the tender wheat leaf sheath surrounding the embryonic head, causing the leaf sheath to become fleshy and thick and later hard and woody, thus compressing the stem to such an extent that little or no sap reaches the developing head. As a result the head usually protrudes only one or two inches beyond the leaf sheet. The larvæ remain in the wheat stubble until the following spring and then pupate and emerge as adults in May. The species has refused to develop in any plant other than wheat.

H. hordei, which for many years has been a source of serious injury in all the barley-growing sections in the Eastern United States, has not as yet been introduced into Wisconsin, Minnesota, and the Dakotas. Its injury to barley is exactly the same as that caused to wheat plants by *H. tritici*. The larvæ remain in the old barley stubble until the following spring, when they pupate and emerge as adults. This in the vicinity of Charlottesville, Va., occurs during May. It develops in barley only.

H. secalis, which has not as yet become of much economic importance, remains in old rye stubble throughout the summer, fall, and winter, pupates in the spring, and emerges as an adult about the middle of May. *H. websteri*, which is of little economic importance, remains in the old rye stubble until spring, when the larvæ change to pupæ, the adults emerging about the middle of May.

The parasites of *H. tritici* have held it in check. Experiments covering a period of three years in which infested stubble was plowed soon after harvest and disked and peas or soy beans sown show this to be a very effective control measure for *H. tritici*, the infestation in these trials being reduced from 8 to 1 per cent, from 32 to 3 per cent, and from 19 to 2 per cent. The barley jointworm, the rye jointworm, and the rye straw worm can undoubtedly be controlled in the same manner if the necessity arises. The wheat straw worm is very easily controlled, and since one generation is wingless it is only necessary to keep down all volunteer wheat and never plant wheat nearer than 40 to 50 yds. from infested stubble. See following article.

The migration of Harmolita grandis form minutum: An important factor in its control, W. H. Larrimer and A. L. Ford (*Jour. Econ. Ent., 12 (1919), No. 6, pp. 417–425, pl. 1, figs. 3*).—The authors report the results of studies by the Bureau of Entomology of the U. S. Department of Agriculture made at West La Fayette, Ind. The purpose was to determine the distance the first or spring generation of the wheat straw worm (*H. grandis minutum*), which is largely wingless and which hibernates largely in the stubble, can migrate, thus determining the distance that wheat can be sown from stubble of the previous year's crop without danger of infestation.

In examinations of eight fields the greater part of the infestation occurred within 10 yds. of the standing stubble, and beyond 30 yds. the infestation became practically negligible. "The amount of infestation varied markedly in the eight fields, ranging from 20.1 to 6.2 per cent at the stubble, but in every case it decreased in practically the same ratio as the distance from the stubble increased. These data show that under ordinary conditions very few of the wingless adults of this species will migrate farther than 30 yds. from the stubble which marked their emerging place." In examinations made of several fields which were in wheat the previous year only a trace of the spring generation of this species was found, and that only where the stubble of the previous year's crop had been improperly plowed.

Examinations were also made in the same eight fields for the second or summer generation infestation, four counts being made, namely, next to stubble, and at 50, 100, and 150 yds. The counts showed that while the heaviest infestation remained in those parts of the fields nearest the standing stubble, comparatively high infestations were found even at 150 yds., or approximately in the middle of most of the fields used in the count. The studies made of second generation individuals, which are winged, show them to be strong fliers, and that they infest all wheat fields over the whole general neighborhood fairly uniformly. Thus control measures should be directed against the first generation. "By planting wheat not closer than 30 yds. to standing stubble, one is fairly safe from infestation. Where the stubble can be thrown under without plowing up a hay crop, it should be, but where the hay crop is to be left with the stubble, the following year's wheat should not be sown within 30 yds. of it. If it should be, it will act merely as a breeding place for the first generation, and the resulting winged second generation will then infest the whole field and near-by fields as well." The importance of keeping down all volunteer wheat in or near stubble is emphasized.

The sugar cane beetle borer parasite (Ceromasia sphenophori) in Queensland, J. F. Illingworth (*Jour. Econ. Ent., 12 (1919), No. 6, pp. 457–459*).—This is a report of the present status of a tachinid parasite of the sugar cane beetle borer (*Rhabdocnemis obscura*), which was introduced into North Queensland in 1914 from Fiji, where it had been established by the author in 1913 (E. S. R., 32, p. 350).

As a result of parasitism by *C. sphenophori*, the beetle borer is no longer a serious pest in the Mossman district. The ant *Pheidole megacephala*, which was present in the cane fields of North Queensland, as was found to be the case in Fiji, is an important enemy of this parasite.

A successful method of breeding parasites of white grubs, J. F. ILLINGWORTH (*Jour. Econ. Ent., 12 (1919), No. 6, pp. 455–457, pl. 1*).—This is a description of a method devised by the author in North Queensland in the course of breeding work with two abundant species, namely, *Campsomeris tasmaniensis* and *C. formosus*.

A migrating army of millepeds, F. E. BROOKS (*Jour. Econ. Ent., 12 (1919), No. 6, pp. 462–464*).—This paper relates to the migration of *Fontaria brunnea* and *F. virginiensis* in West Virginia.

FOODS—HUMAN NUTRITION.

The feeding of nations, E. H. STARLING (*London: Longmans, Green, & Co., 1919, pp. IX+146*).—This book consists of the Oliver-Sharpey lectures delivered at the Royal College of Physicians, London, on June 3 and 5, 1919, on the general principles which must be followed in any successful attempt to secure an equitable division of the entire food resources of a nation among the individuals belonging to that nation.

Following an historical review of the method of attacking this problem in Germany at the beginning of the war, in England by the Physiological War Committee of the Royal Society and various Government agencies, and for the allied nations by the Interallied Scientific Food Commission, the food problem in its broadest aspects is discussed "as it appeared to the Interallied Scientific Commission, and as it must present itself in the future to any Government which is charged with the responsibility of controlling the whole question of production, supply, and distribution of food to its armies, militant and industrial."

The subject matter includes a discussion of the methods involved in the calculation of the energy requirement in calories of the total population of a nation, the influence of a restricted food supply upon a nation, the limits within which the ordinarily accepted quantities of the various foodstuffs can be varied without detriment to health and efficiency, the different policies in regard to the provisions of food as illustrated by Germany and by the United Kingdom, and the policy adopted by the latter for the distribution of food.

Food for the family, M. H. HIGGINS, I. ALDERSON, and E. TAYLOR (*Tex. Agr. Col. Ext. Bul. B-53 (1920), pp. 44, fig. 1*).—This bulletin consists of a series of lessons dealing in a definite sequence with the principles underlying the cooking of different types of food and with some of the more important problems of dietetics. The lessons, which are designed to serve as programs for women's clubs, contain references to Farmers' Bulletins and U. S. Food Leaflets, suggested outlines for papers to be prepared from these references, and brief notes and recipes bearing upon the particular subject of the lesson.

Increase or decrease in the average retail prices of staple foods in July, 1914, and February, 1920 (*Natl. Food Jour. [London], 3 (1920), No. 50, pp. 31, 32*).—This is a table giving the average retail prices of staple foods in Great Britain, France, Italy, Norway, Sweden, Denmark, Holland, Switzerland, the United States, Belgium, and Germany in July, 1914, and the prices in February, 1920, of the same foods calculated as percentage increases over the 1914 values.

Nutritive value of the proteins of the barley, oat, rye, and wheat kernels, T. B. OSBORNE and L. B. MENDEL (*Jour. Biol. Chem., 41 (1920), No. 3, pp. 275–303, figs. 13*).—The comparative nutritive values of the proteins of barley, oats, rye, and wheat have been determined by a series of experiments in which growing rats were fed the finely-ground seed mixed with 3 per cent of a suitable salt mixture, 5 per cent of butter fat, and, where necessary, enough corn starch to make the total protein of the ration approximately 5, 8, and 10 per cent. The growth results obtained were calculated in gains in body weight per gram of protein eaten according to the method previously noted (E. S. R., 40, p. 765), beginning at a body weight of from 70 to 80 gm. and including the subsequent first 4 weeks, and also the first 10 weeks.

With all of the cereal grains used, poor growth resulted at the 5 per cent protein level, but satisfactory growth at the 8 and 10 per cent level with the exception of the rye. With this cereal satisfactory growth was obtained for a few weeks at the 8 and 10 per cent levels, after which nearly all the rats declined and died from some unknown cause.

The growth results obtained for the first 4 weeks showed a slight advantage for the barley proteins over the other three, but this was scarcely apparent over the longer period, thus indicating comparative equality. The data also indicate that the efficiency of the cereal proteins is somewhat less than that of lactalbumin and casein. This is thought to emphasize the advantage of the addition of more efficient supplementary protein to the cereal protein, as has been pointed out elsewhere (E. S. R., 41, p. 261). The efficiency of the proteins of the whole cereals was found to be much higher than that of wheat endosperm.

It is pointed out that the unexpected availability for growth of the proteins of these whole cereals is in harmony with the recent findings of Sherman and his collaborators with regard to the efficiency of oat and maize proteins (E. S. R., 41, p. 763).

Studies in nutrition, II, III (*Jour. Biol. Chem., 41 (1920), No. 3, pp. 379–399, figs. 8*).—In continuation of the nutrition investigation previously noted (E. S. R., 41, p. 262), two papers are presented.

II. *The rôle of cystin in nutrition as exemplified by nutrition experiments with the proteins of the navy bean, Phaseolus vulgaris*, C. O. Johns and A. J. Finks (pp. 379–389).—In this paper the literature on the nutritive value of phaseolin is reviewed, and an investigation of the cause of its failure to promote growth is reported.

From data obtained by the authors at the Bureau of Chemistry, U. S. Department of Agriculture, and hitherto unpublished data contributed by Osborne and Mendel, the conclusion is drawn that the failure of phaseolin to promote growth is due partly to its low content of cystin, and partly to some as yet unexplained factor, possibly a toxin, associated with the material in its raw state. By boiling the phaseolin with water and adding 2 per cent of cystin, the resulting material furnished adequate protein for normal growth in young rats. Similarly cooked navy bean meal supplemented with cystin proved much more efficient than the raw meal without the cystin.

III. *The nutritive value of commercial corn gluten meal*, C. O. Johns, A. J. Finks, and M. B. Paul (pp. 391–399).—The purpose of the experiments reported in this paper was to determine the nutritive value of commercial gluten meal and to find some cheap concentrate to supplement the deficiencies in lysin and tryptophan of the zein composing about one-half of the proteins of the gluten meal.

A diet containing 53 per cent of gluten meal, equivalent to 19.4 per cent of protein, together with a suitable salt mixture, starch, butter fat, and lard, proved to be inadequate for the growth of young rats, but by the addition of 3 per cent of dried brewers' yeast satisfactory growth was obtained, indicating that the corn gluten contains a mixture of proteins adequate for normal growth if taken in sufficient quantity.

Rats fed on a diet in which the sole protein and the water-soluble vitamin were furnished by 25 per cent of corn gluten (equivalent to 9 per cent of protein) and 25 per cent of coconut press cake (equivalent to 5 per cent of protein) grew normally. Good results were also obtained with 30 per cent of corn gluten and 31 per cent of coconut press cake. "Hence, it seems practical and economical to supplement gluten meal with coconut press cake, both for the purpose of supplementing the proteins of gluten meal and adding the water-soluble vitamin which gluten meal lacks."

Is fat indispensable for well being? (*Jour. Amer. Med. Assoc.*, *74* (*1920*), *No. 11*, *pp. 737, 738*).—This is an editorial discussion based primarily upon the report of Hindhede regarding the effects of food restrictions in Denmark during the war (E. S. R., 42, p. 459). It is suggested that the success of the ration used in Denmark, which did not make special provision for fat, points to the possibility that fat may not be an indispensable constituent of the diet, and that the seeming necessity for it may be due to the fat-soluble vitamin. The Danish ration, which was preponderatingly vegetarian and contained large amounts of bran, probably supplied sufficient amounts of this vitamin.

The direct replacement of glycerol in fats by higher polyhydric alcohols, I, II (*Biochem. Jour.*, *13* (*1919*), *No. 3*, *pp. 296–305*).—Two papers are presented.

I. *The interaction of olein and stearin with mannitol*, A. Lapworth and L. K. Pearson (pp. 296–300).—With a view to obtaining glycerol from fats by a process which would leave the by-products of the reaction in a form suitable for edible purposes, olive oil was distilled under reduced pressure with the polyhydric alcohol mannitol in the presence of sodium ethoxid as a catalyst. Similar experiments were also performed with stearin in place of olive oil.

In both cases nearly the whole of the glycerol present in the original fat was recovered in the distillate, the maximum yield of glycerol being reached when the proportion of fat to mannitol corresponded with two molecules of fat to three of mannitol. The other products were water with a little alcohol and a substance resembling in many respects the original fat. A study of the percentage composition of the purified fat has led to the conclusion that it consists mainly of the dioleates and distearates, respectively, of mannitan and isomannid, although direct evidence has not been obtained of the presence of mannitan and isomannid residues in either product.

II. *The value of synthetic mannitol olive oil as a food*, W. D. Halliburton, J. C. Drummond, and R. K. Cannan (pp. 301–305).—This paper presents the results of an investigation of the digestibility and nutritive value of the mannitol oil noted above. The oil is described as having a light greenish-brown color and a taste and odor reminiscent of but less pleasant than that of olive oil. The iodin number of the oil was 82.4 and the saponification number 159, and it contained 4 per cent of free fatty acids calculated as oleic acid.

In the first feeding experiments nearly mature rats were used, and all of the fat of the diet was supplied by the mannitol oil. On this ration the rats tended to lose weight, and the food consumption was not good. In all cases, however, the absorption of the oil was good, as shown by a percentage utilization of 95.8 as compared with 96.6 for olive oil and 97.8 for butter fat and olive oil. Young rats on a diet in which the fat was supplied by a mixture of mannitol oil and butter did not grow quite so well as those fed olive oil and butter, but were in as satisfactory a condition at the end of the experiment. This is thought to indicate that there was no toxic factor present in the oil, but that it was slightly less palatable than the olive oil.

Effects of feeding with calcium salts on the calcium content of the blood, W. Denis and A. S. Minot (*Jour. Biol. Chem., 41 (1920), No. 3, pp. 357–361*).—The possibility of increasing the concentration of calcium in the blood by ingestion of calcium salts was studied on 5 human subjects and on cats and rabbits. In the human subjects the ingestion thrice daily of 2 gm. of calcium lactate did not alter the calcium content of the blood plasma. In cats and rabbits, when the initial calcium concentration was low, it was sometimes possible to increase greatly the amount of calcium in the plasma by feeding calcium lactate.

The occurrence of zinc (and copper) in human organs and excretions and in food materials, E. Rost and A. Weitzel (*Arb. Reichsgsndhtsamt., 51 (1919), No. 3, pp. 494–520*).—Determinations by the method noted on page 710 of this issue are reported of the content of zinc in feces, urine, various organs, and tissues of man and of animals, and in food materials. The copper content of the same materials was also determined in a number of cases.

The maximum zinc content of various foods, arranged in order of decreasing magnitude in milligrams of zinc per kilogram of food material, is reported as follows: Liver 339, meat 50.4, dark bread 7.8, brain 6, cow's blood 5.6, and potatoes 2.3 mg. Goat's and cow's milk, milked into glass receptacles, was found to contain from 2.3 to 3.9 mg. zinc per liter, and market milk no larger amounts. The storage of food material in zinc-containing receptacles did not appear to increase their zinc content.

In the organs of human bodies zinc was found to the extent of 145.5 mg. per kilogram in the liver, 51.5 mg. in the muscles, and 12.5 in the brain. The amount of zinc found in human feces varied from 2.7 to 18.9 mg. per day, as much as 39.3 mg. being occasionally found. Slight traces only of zinc were found in the urine.

The addition of zinc-containing beef liver to the diet of persons excreting normal amounts of zinc did not greatly increase the output of zinc in feces or urine, thus indicating that the greater part of the zinc must have been absorbed by the body. Small amounts of copper were regularly found in the food materials and organs containing zinc.

The conclusion is drawn that zinc can no longer be considered as of accidental occurence in the human body, but on the contrary is one of its normal constituents. A list of 30 references to the literature is appended.

The function of vitamins in the metabolism of Sclerotinia cinerea, J. J. Willaman (*Jour. Amer. Chem. Soc., 42 (1920), No. 3, pp. 549–585, figs. 8*).—This contribution from the Minnesota Experiment Station consists of an extensive study of the vitamin requirements of *S. cinerea*, the brown rot fungus of peaches and plums. In connection with this study the existing literature on vitamins has been reviewed and discussed.

The author defines vitamins as follows: "Vitamins constitute a class of substances, the individuals of which are necessary for the normal metabolism of certain living organisms, but which do not contribute to the mineral, nitrogen, or energy factors of the nutrition of those organisms." It is pointed out that this definition does not assign any specific function to the vitamins, does not limit them to either plant or animal organisms, does not imply anything as to the nature, properties, composition, or number of the vitamins, and does not claim that a given metabolic activity will not take place at all in the absence of the vitamins but only that it will not take place normally.

It was found that while *S. cinerea* can not grow on a medium composed of sucrose, salts, and asparagin, it grows readily on such a medium when small amounts of plant decoctions, particularly of the fruits of plums and peaches, are added. The factor furnished by such decoctions was found to be of the nature of a vitamin.

By adsorption on fuller's earth vitamin preparations were made from a large number of plant and animal materials, including the leaves and buds of plants, seeds, seed sprouts, tuber sprouts, rice polish, sporophores and mycelia of fungi, the mycelium of Sclerotinia itself, pollen of maize, fruit juices, wort, autolyzed yeast, milk, and pancreatin. All of these preparations promoted growth in the Sclerotinia, and a few promoted reproduction as well. The amount of reproduction in any given case was not necessarily proportional to the amount of vegetation. The materials which brought about the highest degree of reproduction were pollen, fungus, sporophores, yeast, peach juice, and the terminal buds of *Phaseolus multiflorus.*

These results are discussed on the hypotheses (1) that two vitamins are involved, and (2) that only one vitamin is concerned. While considerable evidence in support of the first hypothesis is advanced, the author considers the hypothesis of the existence of a single vitamin for Sclerotinia to be more plausible.

"It is very probable that reproduction in Sclerotinia is simply a different manifestation of the same activities as characterize vegetation. The single activity that is apparently most dependent on a vitamin supply is respiration. Respiration is common to all the materials which have yielded the vitamin; and the degree of metabolic, and hence respiratory, activity in these materials is proportional to the activity of the vitamin prepared from them. Thus the evidence is accumulating in favor of the view that there is a close connection between respiration in a cell and its vitamin content, and also its vitamin requirement. Just which cells in the plant world can synthesize this vitamin is still an open question. The Sclerotinia vitamin is possibly identical with the water-soluble B of the higher animals; and since the latter can not synthesize this vitamin, it becomes an important point to know which plant organs can."

Nutritive factors in plant tissues.—III, Further observation on the distribution of water-soluble vitamin, T. B. OSBORNE and L. B. MENDEL (*Jour. Biol. Chem., 41 (1920), No. 3, pp. 451–468, figs. 10*).—In continuation of the studies previously noted (E. S. R., 41, p. 762), the examination by the same methods is reported of the water-soluble vitamin content of alfalfa, cabbage, clover, spinach, and timothy dried as previously described; of beet, carrot, and turnip root washed, cut into thin slices, air dried at 50 to 60° C., and ground; of commercially canned tomatoes dried at 60 to 70° and ground; and of whole and pared potatoes and potato peel boiled and dried at 60 to 70°. The experiment with each dried food extended over eight weeks, starting with healthy growing rats weighing about 90 gm. each. The daily doses of the dried food consisted in most cases of 1 and 0.5 gm. portions with occasionally 0.2 and 2 gm. doses.

The results as indicated by the growth charts may be summarized as follows: Alfalfa and clover proved richest in the water-soluble vitamin, better results being secured with 1 gm. doses than have ever been obtained in the same laboratory with 16 cc. of milk as the source of the water-soluble vitamin. Timothy hay did not prove a satisfactory source of the vitamin. With tomatoes 1 gm. doses promoted very good growth, and amounts as low as 0.2 gm. limited growth or at least maintenance. Spinach, cabbage, turnip, and carrot proved less potent than tomato, 1 gm. doses being about equivalent to 0.5 gm. of the dried tomato. The beet root did not equal the other roots tested, a result in harmony with the observations of Steenbock and Gross (E. S. R., 42, p. 460). The potato was as rich in water-soluble vitamin as some of the roots. Potato peel showed no advantage over the rest of the potato, and new potatoes no marked superiority to old.

It is pointed out that, inasmuch as the daily allowance of water-soluble vitamin was fixed while the food intake varied, the ratio of the dried product to the total food varied in the different experiments. When 1 gm. portions of the dried product were used these ranged from 10 per cent or less of the food intake in the animals which grew best to 15 per cent or more at the other extreme of the series, while in the 5 gm. experiments the content of plant food in relation to the total food ranged from 5 to 9 per cent.

Experiments on the utilization of the calcium of carrots by man, M. S. Rose (*Jour. Biol. Chem.*, *41* (*1920*), *No. 3*, *pp. 349–355*).—The extent of utilization of the calcium of carrots by the human body was determined by digestion experiments carried out on four young women, the calcium balance being determined for a period in which the calcium intake, supplied by freshly boiled carrots, was close to the estimated minimum for equilibrium.

"In all cases but one there was a positive calcium balance on the carrot diet, and in this case the loss was small. When approximately 55 per cent of the calcium was derived from carrots, one subject had practically the same retention as on a diet in which 70 per cent of the calcium was derived from milk. It seems possible, therefore, to meet the requirement of the adult human organism for calcium largely, if not wholly, from carrots."

It is pointed out that these results are strikingly different from those obtained by McClugage and Mendel (E. S. R., 39, p. 876) with dogs, their experiments indicating that calcium is poorly utilized when derived from carrots.

Relative antiscorbutic value of fresh, dried, and heated cow's milk, R. E. Barnes and E. M. Hume (*Biochem. Jour.*, *13* (*1919*), *No. 3*, *pp. 306–328*, *figs. 3*).—This is the complete report of an investigation the results of which have been previously noted from another source (E. S. R., 42, p. 162).

The antiscorbutic property of dehydrated meat, M. H. Givens and H. B. McClugage (*Science*, *n. ser.*, *51* (*1920*), *No. 1315*, *pp. 273–275*, *fig. 1*).—The literature on the antiscorbutic properties of meat is reviewed, and experiments are reported in which meat dehydrated by the vacuum process described by Falk et al. (E. S. R., 41, p. 807) and subsequently air-dried for several days was used as the only source of antiscorbutic vitamin in feeding experiments with guinea pigs. The dried meat was fed both uncooked and cooked for 15 minutes at 100° C., about 1.5 gm., representing approximately 15 per cent of the total solids ingested, being eaten daily by each guinea pig. In no case did the meat afford any protection against scurvy.

It is pointed out that these findings are in accord with those in the literature reviewed with the exception of the results of Pitz (E. S. R., 40, p. 272), which indicated that dried meat to the extent of 10 per cent of the diet delayed the onset of scurvy and prolonged the life of the animals. The authors agree with Dutcher and associates (E. S. R., 41, p. 861) that the favorable results obtained by Pitz were due to the amount of milk consumed by the guinea pigs and not to antiscorbutic properties in the meat.

Edema as a symptom in so-called food-deficiency diseases, A. D. Bigland (*Lancet* [*London*], *1920*, *I*, *No. 5*, *pp. 243–247*).—The author has attempted to correlate various epidemics of edema or dropsy with a view to determining a common etiological factor. The epidemics discussed include an outbreak of edema occurring in Turkish prisoners of war in Egypt in 1916, edema in Europe during the recent war, epidemic dropsy occurring in India at various times, ship beriberi and scurvy, and an outbreak of edema in East Africa.

A discussion of possible causative factors and of the mechanism of edema production has led the author to conclude that "epidemic dropsy is a condition due to affection of the suprarenal glands as a result of inanition arising from starvation, complete or partial. It may be that the suprarenals hypertrophy at the expense of the other endocrine organs and by their increased function give rise to dropsy. Possibly, also, this hyperactivity may in time give place to a suprarenal insufficiency as exophthalmic goiter gives place to myxedema. This second condition may be pellagra. Whatever the true explanation may be, it is extremely probable that food deficiency, together with disordered function of certain endocrine organs, plays a large part in the causation of epidemic dropsy and pellagra."

A list of 22 references to the literature is appended.

Pellagra, H. F. HARRIS (*New York: The Macmillan Co., 1919, pp. X+421, pls. 7*).—This monograph contains a very complete résumé and discussion of foreign literature on pellagra, together with brief references to some of the investigations on this subject in the United States. The subject matter is treated under the following chapter headings: Synonyms and history and brief résumé of more important early papers, causation, pathological anatomy, symptomatology, diagnosis, prognosis, prophylaxis, treatment, and relationship of pellagra to life insurance.

An appendix contains a paper on "Run-out" Condition, Poor Germination, and Rotting of Indian Corn, by P. O. Vanatter, and copies of the Austrian and Italian laws on bad maize and pellagra. An extensive bibliography and a series of illustrative plates are included.

In the chapter on causation of pellagra, the author offers the following tentative explanation of the etiology of the disease:

"Pellagra is an extremely chronic endemic affection of temperate and subtropical countries, i. e., where Indian corn is grown and much eaten. While the malady has been generally thought in the past to be the consequence of inanition, the result of an inadequate diet, it has been more recently regarded as the effect of the habitual consumption of Indian corn, and possibly in rare instances of eating other starchy foods that have been acted upon by low vegetable forms; if this theory should be found to be correct the disease is probably more directly the result of the action of certain phenol poisons, produced by molds while growing in these cereals, and possibly of albuminous and ferment toxins contained in sound maize, all of which together, acting from one generation to another, and not unlikely intensified by bad hygienic conditions and insufficient and imperfect food, ultimately culminate in a frank outbreak of the classical symptoms of this disease. Finally, it can not be too strongly urged that the malady is probably always hereditary, no person ever in his lifetime eating enough maize to produce the disease."

Botulism (*Pub. Health Rpts.* [*U. S.*], *35* (*1920*), *No. 7, pp. 327–330*).—This article describes the protective measures taken by the Bureau of Chemistry, U. S. Department of Agriculture, in regard to botulism from ripe olives. The batches of olives found responsible for the recent outbreaks of botulism (E. S. R., 42, p. 261) have been removed from the market, and an investigation of the olive-packing plants in California has been conducted. This has shown that the process of sterilization employed in the case of olives packed in glass is usually inadequate. The jars are usually heated for about one-half hour at the temperature of boiling water, a temperature too low to kill the botulinus bacilli present in the olives.

According to these investigations "it would appear that the public may protect itself by refraining for the present from the consumption of ripe olives packed in glass. As a further measure of precaution, no food of any description showing even the slightest unnatural odor, unnatural color, swelling of the container, signs of gas, or any evidence of decomposition whatever should be used for food purposes. In practically every case of botulism the food was shown to have had an offensive or abnormal odor. While all spoiled food may not contain *Bacillus botulinus*, any spoiled food, even though the spoilage be slight, may contain it, and, in view of the fatal effect of very small amounts of the toxin which this organism generates, the only safe rule is to examine carefully all food products before they are served and to discard those which are even slightly suspicious."

ANIMAL PRODUCTION.

Studies of heredity in rabbits, rats, and mice [I–III], W. E. Castle (*Carnegie Inst. Wash. Pub. 288 (1919), pp. 56, pls. 3, figs. 5*).—The following three papers are presented. Page references cover only the descriptive text as the tabular matter is segregated in an appendix.

I. *Further experiments upon the modifiability of the hooded character of rats* (pp. 1–3).—The continuation of selection experiments with piebald rats (E. S. R., 39, p. 377) is reported. Because of the results secured when the selected individuals were crossed with wild rats, the author withdraws his previous contention that genes can be modified by selection. The wild race, "when its residual heredity is made fully effective by repeated crosses, brings both the plus-selected and the minus-selected hooded lines to a phenotype of common grade."

II. *The inheritance of white-spotting in rabbits, with special reference to gametic contamination* (pp. 4–28).—The author reports breeding experiments with rabbits involving a study of the amount of spotting shown by descendants of matings between self and Dutch pattern rabbits and between self and English pattern. The Dutch pattern is recessive to self, and occurs in several typical varieties which were found to form with self a set of at least four multiple allelomorphs. The English pattern was found to be the heterozygous expression of a dominant white-spotting.

III. *Observations on the occurrence of linkage in rats and mice* (pp. 29–36).—In breeding experiments with rats in which nearly 5,000 young were secured, a crossover percentage of 18 was observed between the allelomorphs for pink-eyed yellow and red-eyed yellow. Crossing over seemed to occur with equal facility in both sexes. Albinism was found to be completely linked to red-eye and to be as closely linked to pink-eye as pink-eye is to red-eye.

In mice pink-eye and albinism were found to be partially linked, the percentage of crossovers being about 14.

Linkage in rats, H. L. Ibsen (*Amer. Nat., 54 (1920), No. 630, pp. 61–67*).—The author presents results of breeding experiments with rats at the Wisconsin Experiment Station and reports lack of linkage (1) between the red-eye allelomorphs and the self-Irish-hooded set of allelomorphs, (2) between red-eye and agouti, and (3) between agouti and self. Since red-eye was shown by Castle (E. S. R., 39, p. 877) to be linked both to pink-eye and to the set of allelomorphs comprising intense pigmentation, nonyellow, and albinism, the author's data indicate that the five known sets of allelomorphs concerned with coat color in rats belong in three linkage groups.

The conclusion of Castle (noted above) that red-eye is completely linked with albinism is also confirmed.

Anomalous ratios in a family of yellow mice suggesting linkage between the genes for yellow and for black, L. C. Dunn (*Amer. Nat., 53 (1919), No.*

629, pp. 558–560).—A limited amount of data is presented, but sufficient in the author's opinion to indicate some linkage between yellow and black in mice.

Genetic studies in rabbits.—I, On the inheritance of weight, R. C. PUNNETT and P. G. BAILEY (*Jour. Genetics, 8 (1918), No. 1, pp. 1–25, figs. 12*).—The authors record some data as to the body weights and rates of growth of F_1 and F_2 individuals from two rabbit crosses, (1) between the Flemish, one of the heaviest breeds, and a small-sized mixed strain, and (2) between Flemish and Polish, the latter the lightest-weight breed known. Only tentative conclusions are drawn, but it is suggested that "early maturity may depend upon some factor or factors independent of size, though probably a larger rabbit would mature later than a smaller one where both were similarly constituted with regard to the specific genetic factors upon which onset of maturity depended."

Color inheritance in cats, with special reference to the colors black, yellow, and tortoise-shell, C. C. LITTLE (*Jour. Genetics, 8 (1919), No. 4, pp. 279–290*).—This paper is a critical analysis of proposed solutions of the problem of the inheritance of tortoise-shell and related colors in cats. The author follows Whiting (E. S. R., 42, p. 376) in regarding yellow (Y) as a sex-linked dominant to black (*y*). Tortoise-shell females are considered heterozygous for Y. The anomalous occurrence of black females from the matings yellow ♂×black ♀ and yellow ♂×tortoise-shell ♀ and of tortoise-shell females and black males from matings of yellow×yellow are explained by a new hypothesis, viz, that some (perhaps 50 per cent) of the Y genes in certain yellow individuals are transformed into *y*'s. The occurrence of tortoise-shell males, which as Wright pointed out (E. S. R., 40, p. 869) is a much rarer event, is considered an entirely distinct phenomenon and capabe of explanation as a case of nondisjunction (E. S. R., 35, p. 272).

Inheritance of white-spotting and other color characters in cats, P. W. WHITING (*Amer. Nat., 53 (1919), No. 629, pp. 473–482*).—The author reports a continuation of work previously noted (E. S. R., 42, p. 376), and includes a general summary of known facts about inheritance of coat color in cats.

A note on the fate of individuals homozygous for certain color factors in mice, C. C. LITTLE (*Amer. Nat., 53 (1919), No. 625, pp. 185–187*).—The author examined 16 gravid uteri of yellow female mice that had been mated to yellow males and found 91 normal and 21 (18.7 per cent) degenerating embryos, thus confirming the observations of Ibsen and Steigleder (E. S. R., 38, p. 573) that in such matings a high proportion of the embryos die in utero. In 2 matings of yellow ♂×nonyellow ♀ and 3 of nonyellow ♂×yellow ♀ there was a total of 35 normal embryos and one "small apparently embryonic mass" interpreted as a possible degenerating embryo.

It is also noted that similar degenerating embryos (27.2 per cent out of a total of 22) were found in matings of black-eyed white×black-eyed white mice. The author had previously found that the black-eyed white character resembles yellow in that homozygotes have not been found (E. S. R., 40, p. 275).

The fate of homozygous yellow mice, W. B. KIRKHAM (*Jour. Expt. Zool., 28 (1919), No. 2, pp. 125–135, figs. 2*).—A detailed report of work previously noted from a preliminary paper (E. S. R., 38, p. 573). It is stated that the albino mice used as controls were of a stock known by breeding tests not to carry yellow. Phagocytes were found to aid in the destruction of the abnormal blastulae shortly after their implantation.

Uterine, tubal and ovarian lysis and resorption of conceptuses, A. W. MEYER (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 36 (1919), No. 4, pp. 283–308, figs. 10*).—The author calls attention to the retrogression of ova and early conceptuses in various mammals reported by previous workers, including himself (E. S. R., 40, p. 663), describes some new cases found in collections of human embryological material, and discusses the possible enzyms concerned in the early degeneration and absorption of embryos.

Synthetic pink-eyed self white guinea pigs, H. L. IBSEN (*Amer. Nat., 53 (1919), No. 625, pp. 120–130, figs. 5*).—In this paper from the Wisconsin Experiment Station the author records the formation, by a suitable combination of known hereditary characters, of a race of guinea pigs genetically not albino but having the appearance of extreme albinos, including the white ears hitherto unobtainable by fanciers except as an accident. The genetic factors concerned in the production of color in guinea pigs are described.

Tricolor inheritance.—IV, The triple allelomorphic series in guinea pigs, H. L. IBSEN (*Genetics, 4 (1919), No. 6, pp. 597–606*).—The author presents the evidence, promised in the first paper of this series (E. S. R., 35, p. 770), showing that the genes for complete extension, partial extension, and nonextension of black (or chocolate) pigment in the guinea pig form a set of multiple allelomorphs. The results of all the author's breeding experiments that bear on this matter are tabulated, over 4,100 guinea pigs being involved. A few aberrant ratios were secured, and some individuals when classified on the basis of external appearance seemed to be exceptions, but in all cases where such animals lived long enough to be subjected to a critical breeding test it was found that they belonged in the genotytic class called for by the hypothesis.

Inheritance of congenital palsy in guinea pigs, L. J. COLE and H. L. IBSEN (*Amer. Nat., 54 (1920), No. 631, pp. 130–151, figs. 3*).—The inheritance of a neurosis in guinea pigs characterized by clonic spasms of the legs was studied, and found to be a simple Mendelian recessive to normality. The heterozygous animals were entirely normal in their reactions.

Studies on inheritance in pigeons.—III, Description and linkage relations of two sex-linked characters, L. J. COLE and F. J. KELLEY (*Genetics, 4 (1919), No. 2, pp. 183–203*).—This paper continues a series of reports on pigeon breeding at the Wisconsin Experiment Station (E. S. R., 33, p. 371). The factors dealt with are those for intensity of pigmentation, previously studied by Cole (E. S. R., 27, p. 573), and for a variously manifested color condition called for convenience dominant red. The latter character shows only in the presence of the factor for black, and is entirely distinct in appearance and inheritance from the recessive red of Cole's earlier report (E. S. R., 31, p. 572). Its identification is held to clear up confusion in the literature as to inheritance of red in pigeons. Nuttall (E. S. R., 40, p. 275) has discussed one aspect of this character but without recognizing its sex-linked transmission.

Intensity and dominant red were found to be only loosely linked to each other, the rather meager data (73 offspring from critical matings) indicating crossing over of 40 per cent in the male. Among the 988 offspring in the intensity matings and the 366 in the dominant red matings no aberrant cases occurred which could be attributed to failure of sex-linkage. The few recorded cases of such among doves (which Little discusses in the following paper) are examined and dismissed as probable mistakes in the breeders' records.

A marked excess of males was observed in some of the matings involving intensity, and a sex-linked lethal gene closely linked to the dilute gene is suggested as a possible explanation. It was also noted that newly-hatched squabs destined to show intense color are often more abundantly provided with down than are "dilute" squabs, and the possibility that this correlation might be due to another unidentified sex-linked factor is considered.

Alternative explanations for exceptional color classes in doves and canaries, C. C. LITTLE (*Amer. Nat., 54 (1920), No. 631, pp. 162–175*).—The hypothesis of the altered gene developed by the author to explain the occurrence of aberrant color classes in cat breeding experiments (noted on p. 763) is invoked as an explanation of somewhat similar cases recorded for ring doves by Staples-Browne (E. S. R., 28, p. 270) and by Strong (E. S. R., 28, p. 270), and for canaries by Durham and Marryat (E. S. R., 20, p. 1168). The change in these cases, however, would be from the recessive to the dominant allelomorph.

The developmental relations of brachydactyly in the domestic fowl, C. H. DANFORTH (*Amer. Jour. Anat., 25 (1919), No. 2, pp. 97–115, figs. 5*).—The author describes the anatomical and embryological features of the shortened outer toe (digit IV) that commonly occurs in feather-legged chickens, and concludes on the basis of these observations and the results of the breeding experiments noted below that brachydactyly and feathering on the tarsi are manifestations of a single set of hereditary conditions. A preliminary report has been noted (E. S. R., 42, p. 68).

When the outer toe is of normal proportions it is longer than the inner toe (digit II), and the author proposes as an index of brachydactyly the ratio of 100 times the length of digit IV to the length of digit II, an individual's index being the average of the indices of its two feet. In the brachydactyl individuals examined the index ranged from 100 (all five phalanges present, the fourth being somewhat reduced) to 70 (second, third, and fourth phalanges shortened and fused, fifth or terminal phalanx absent).

The condition was recognized with certainty in embryos on the tenth day of incubation. "The fact that brachydactyly is apparent at the time when cartilages are formed, if not actually before then, would seem to indicate that the reduction of the skeleton takes place in response to conditions already manifest in the toe, and not as a result of any factor acting specifically on cartilage or bone formation. In other words, the cartilage anlagen form while subjected to a kind of compression resulting from the shortening of the toe."

Since feather-legged pigeons are often web-footed as well as brachydactylous, it is suggested that syndactyly belongs in the same hereditary complex as the other two characters. The author's breeding experiments demonstrated that polydactyly is transmitted independently of brachydactyly in the fowl.

An hereditary complex in the domestic fowl, C. H. DANFORTH (*Genetics, 4 (1919), No. 6, pp. 587–596, figs. 5*).—The author presents the results of his studies on the inheritance of brachydactyly, ptilopody (a term proposed as a precise designation for booting or leg-feathering), and syndactyly in the domestic fowl, including some critical evidence, secured since the preceding paper was written, in support of the theory that these three characteristics are the product of a single factor or group of factors.

The experiments began with a booted brachydactyl male, one of whose parents was clean-legged and normal-toed. His offspring from White Leghorn females were crossed with Black Minorcas and also mated inter se. The Leghorns and Minorcas were all normal-toed and clean-legged. Records of over 550 descendants of the original booted specimen were secured.

The back crosses of brachydactyl ptilopod F_1's on normal-toed aptilopod birds produced 255 normal-toed aptilopod chicks, 138 brachydactyl ptilopod, 40 brachydactyl aptilopod, and 8 normal-toed ptilopod. That the latter two classes were not crossover classes produced by partial linkage between two distinct factors, one for brachydactyly and the other for ptilopody, is shown by the fact that similar arrays were secured where either normal-toed ptilopod or short-toed aptilopod individuals were mated to Minorcas. Four web-footed offspring were also produced in the course of the experiments, although none of the breeding stock was syndactyl. Since syndacytyly is normally a dominant trait in poultry, and since in each case one parent at least was brachydactyl or ptilopod, syndactyly is included provisionally in the hereditary complex.

The theory of the interchangeability of these characters is used to explain aberrant results obtained by Davenport (E. S. R., 23, p. 75) and Punnett and Bailey (E. S. R., 41, p. 472). The author holds that the ptilopod condition consists primarily of modifications in size, form, and distribution of the scales on the tarsi. "In its mildest manifestation only the scales are involved. In slightly more pronounced instances there appears in addition a modified quill or rudimentary feather, generally on the basal phalanx of the fourth toe. Further intensities of manifestation may be traced through the ten stages recognized by Davenport." Adoption of this view would necessitate the revision of much past work on the inheritance of booting.

It is pointed out that differences in the time at which a disturbing factor becomes effective in embryonic life would explain the variable manifestations of the three characters in question. Coming into play on the seventh or eighth day of incubation it might produce permanent webbing since all chicks are web-footed at this stage; two days later the critical period for syndactyly might be passed, but the cartilages of the toe would be in their formative stage and might be susceptible to change; and finally by the twelfth day, although too late for changes in toe proportions, the disturbing conditions might still be able to modify the scales and feather germs.

Evidence that germ cells are subject to selection on the basis of their genetic potentialities, C. H. Danforth (*Jour. Expt. Zool., 28 (1919), No. 3, pp. 385–412*).—The heterozygous brachydactyl birds used as breeders in four of the experiments noted above were exposed to alcohol (inhalation method) two hours or more daily for six weeks to two months following (in one experiment preceding) the period in which the data on "normal" inheritance were collected. The latter data furnished a complete control, as the unalcoholized mates were the same in both cases.

The purpose was to determine whether alcohol treatment would alter the relative proportions of gametes produced by heterozygotes. Since the alcoholized individuals in three experiments were also heterozygous for white color and for polydactyly, it was possible to study the distribution of color and extra toes in addition to brachydactyly. The main results are given in the subjoined table. In experiment 4 the alcoholized subjects were hens; in the other experiments cocks.

Distribution of characters among offspring of alcoholized and normal fowl heterozygous for brachydactyly, polydactyly, and white color, when mated to triple recessives.

Stock.	Number of offspring.	Brachydactyl.					Polydactyl.				White
		Expt. 1.	Expt. 2.	Expt. 3.	Expt. 4.	Total.	Expt. 1.	Expt. 2.	Expt. 3.	Total.	Total.
		P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Alcoholized.	386	46.7	43.3	53.6	56.3	48.2	29.4	37 9.	52.0	36.0	[illegible]
Control.....	520	39.2	35.1	42.7	38.4	39.0	33.2	39.0	40.1	36.0	[illegible]

It is concluded that the alcohol treatment had no influence on the distribution of color, a possible tendency (in view of experiment 3 where the treatment was unusually severe) to increase the proportion of polydactyl individuals, and a distinct tendency to increase brachydactyly.

On the physiological properties of the gonads as controllers of somatic and psychical characteristics, I, II, C. R. Moore (*Jour. Expt. Zool., 28 (1919), Nos. 2, pp. 137–160, figs. 5; 3, pp. 459–467, fig. 1*).—These two papers are the first of a contemplated series dealing with the effects on rats, guinea pigs, and perhaps other forms of such operations as the removal of gonads and the implantation of germinal tissue from the opposite sex. The experiments were intended in part to duplicate those of Steinach (E. S. R., 27, p. 275; 28, p. 173).

I. *The rat.*—Observations are reported on a single litter of white rats composed of 4 males and 5 females. The gonads were completely removed from 3 males and 3 females at the age of 25 to 35 days, and pieces of ovary from the females were implanted in the abdominal musculature of the castrated males. Pieces of testis were inserted similarly in the spayed females.

There were no differences in body development between the animals operated on and the normal controls that the author is willing to attribute to the transplantations, but Steinach's conclusion that the experimental subjects tend to assume the instincts and behavior of the sex furnishing the transplant was confirmed. Histological examinations indicated that the ovarian grafts remained functional, but the implanted testicular tissue underwent marked degeneration, the seminiferous tubules being more or less isolated and consisting only of large irregular cells, interpreted as Sertoli cells, with no trace of spermatozoa.

II. *Growth of gonadectomized male and female rats.*—The gonads were removed from 18 male and 22 female white rats at ages varying from 23 to 51 days. The castrated males of a given litter in all cases became heavier than their spayed sisters, and the author concludes that the similar weight difference found in normal rats is due to a specific sex difference and not to the secondary influence of the sex glands.

The relation between the number of chromosomes of a species and the rate of elimination of mongrel blood by the pure-sire method, H. H. Laughlin (*Proc. Soc. Expt. Biol. and Med., 16 (1919), No. 8, pp. 132–134*).—Given a 24-chromosome species in which no exchange of segments (crossing-over) between homologous chromosmes occurs, the probabilities are computed that 1, 2, . . ., 10 top-crosses with pure bred sires will eliminate all or all but one of the chromosomes of the original unimproved stock. After 5 generations the grades are essentially "pure" for chromosomes, and further grading up is considered to be of no practical use, granting the initial assumptions.

Analysis of the effects of selection, A. H. Sturtevant (*Carnegie Inst. Wash. Pub. 264 (1918), pp. 68, pl. 1, figs. 14*).—The author reports experiments with an inbred stock of *Drosophila melanogaster* (of the mutant race called dichæt), which manifested variability in the number of thoracic bristles. Strains were developed by selection having both increased and decreased numbers of bristles, but this apparent success of selection is attributed to the presence of modifying factors some of which were made evident by their linkage relations with known factors.

Following the report of experimental work there is a rather extended discussion of cases cited in the literature as examples of contamination of allelomorphs and factor variability. It is concluded that "modification of factors by selection, crossing, fractionation, or similar means is undemonstrated in any given case, and has been shown not to occur in other cases that are typical of the results usually obtained."

Parthenogenesis and crossing-over in the grouse locust Apotettix, R. K. Nabours (*Amer. Nat., 53 (1919), No. 625, pp. 131–142*).—In extending his breeding experiments with Orthoptera at the Kansas Experiment Station (E. S. R., 40, p. 367) to other genera of grouse locusts, the author found that females of at least one species of Apotettix are capable of laying either parthenogenetic or fertilized eggs, the former developing only into females. The parthenogenetic offspring of females heterozygous for several hereditary factors determining pattern were not of a uniform type, but showed various different pattern combinations in proportions which are believed to indicate normal segregation and crossing-over. The chromosomal relations have not been worked out completely as yet, but some evidence was found that the parthenogenetically produced female has fewer than the diploid number of chromosomes.

The author also cites data believed to indicate a certain amount of crossing-over in the male Apotettix.

On the part which the lime in the shell of the hen's egg takes in the formation of the chick's skeleton during incubation, C. Delezenne and E. Fourneau (*Ann. Inst. Pasteur, 32 (1918), No. 9 pp. 413–429, fig. 1*).—In a study of 50 fertile eggs (mostly from hens of the Faverolle breed) opened at various stages of incubation, the authors found that the calcium oxid content of the interior (white, yolk, and embryo combined) remained about 0.06 per cent of the initial egg weight during the first 10 days of incubation (i. e., before the beginning of skeleton formation), and thereafter increased rapidly, particularly after the sixteenth day, reaching 0.34 per cent at hatching. Similar increases were shown by eggs of the pea fowl and the duck examined at the beginning and the end of incubation. Two infertile hen's eggs incubated 14 and 21 days, and 2 eggs held 34 days without incubation, were the same as fresh eggs with respect to calcium content. The phosphorus (P_2O_5) content, recorded for 11 eggs, showed at least no increase and perhaps a slight decrease toward the end of incubation.

It is suggested that the lime of the shell is dissolved in some constituent of the amniotic fluid and passes through the vitellin membrane to supply the embryo with the calcium necessary for the skeleton.

See also the earlier researches of Carpiaux (E. S. R., 20, p. 472), which the authors do not include in their literature review.

On the bacterial and catalase content of hens' eggs, W. Rullmann (*Centbl. Bakt.* [*etc.*], *2. Abt., 45 (1916), No. 6–12, pp. 219–230*).—The author made observations on 21 eggs and found as much catalase present in new-laid eggs as in older eggs that had not decomposed and were still practically sterile. In general, slightly less catalase occurred in the yolk than in the white.

The colors of colloids.—VII, Blue feathers, W. D. Bancroft (*Jour. Phys. Chem., 23 (1919), No. 6, pp. 365–414*).—This paper consists mostly of extensive quotations from the publications of H. Gadow, V. Haecker, M. I. Newbigin, R. M. Strong, and other naturalists who have discussed the optical properties of feather structure, together with a table summarizing Lord Rayleigh's researches on the amount of light of different wave lengths reflected by blue feathers.

It is concluded that blue color in feathers is generally due to the presence of minute air bubbles in a colorless medium, and that the addition of a yellow pigment produces a structural green. It is pointed out, however, that failure to isolate a blue pigment from feathers does not prove that blue color may not in some cases be due to a pigment having a blue surface color but showing some other color on extraction.

Forage substitutes, A. Lhoste (*Les Succédanés des Fourrages. Paris: J. B. Baillière & Sons, 1918, pp. 96*).—The author discusses the feeding value of a large number of little-used plant products and waste materials (algae, leaves, twigs, heather, prickly broom, reeds, horse chestnuts, acorns, pomace, spoiled fruits, sugar beet tops, sugar beet pulp, potato pulp, walnut-, rape-, and olive-residue after oil extraction, legume pods, corn stalks, dried blood, by-products of tanning industry, etc.), citing the known or probable chemical composition of each and using good meadow hay as the basis of comparison.

Commercial feeding stuffs, quarterly report, April 1 to June 30, 1919, E. G. Proulx et al. (*Indiana Sta. Bul. 231 (1919), pp. 3–219*).—This bulletin tabulates the chemical and microscopic analyses of 819 samples of feeding stuffs collected during the second quarter of 1919, including alfalfa meal, tankage, meat scrap, corn feed meal, corn germ meal, hominy feed, cottonseed meal, cottonseed hulls, linseed meal, wheat bran, wheat middlings, red dog, oat flour, oat middlings, rye middlings, rye red dog, velvet bean feed, and a variety of proprietary mixed, calf, and poultry feeds. There is also a list of the brands on sale in the State, together with the manufacturer's guaranty as to the composition of each.

Inspection of commercial feeding stuffs, T. O. Smith (*New Hampshire Sta. Bul. 191 (1919), pp. 42*).—The proximate composition is recorded of samples of alfalfa meal, barley feed, beet pulp, cottonseed meal, distillers' dried grains, linseed meal, linseed cake, gluten feed, hominy feed, velvet bean feed, peanut oil feed, rye middlings, wheat bran, wheat middlings, red dog, and a variety of compounded feeds, calf meals, and poultry feeds.

Commercial feeding stuffs, F. D. Fuller (*Texas Sta. Bul. 251 (1919), pp. 5–241*).—This publication tabulates the proximate analyses of samples of feeding stuffs made during the year ended August 31, 1919. The materials are alfalfa meal, barley chop, barley middlings, dried beet pulp, brewer's dried grains, coconut-oil meal, coconut meal (new process), corn bran, corn chop, ground corn cob, corn feed meal, corn flour, corn gluten feed, corn meal, cold pressed cottonseed, cottonseed feed (cracked and ground), cottonseed cake (ordinary, prime, and choice), cottonseed meal (ordinary, prime, and choice), graham flour, hominy feed, Japanese bean meal, kafir corn chop, linseed meal (old process), meat scrap, milo maize chop, milo maize feed meal, milo maize head chop, ground oats, ground oat hulls, oat meal, cold pressed peanuts, whole pressed peanuts (cracked and ground), peanut feed, peanut oil cake, peanut oil meal, ground peanut hulls, rice bran, rice hulls, rice polish, rough rice, rye bran, rye flour, rye middlings, tankage, velvet bean feed, whole pressed velvet bean, wheat bran (with and without screenings), brown and gray shorts (with and without screenings), wheat mixed feed, white shorts, and a variety of proprietary mixtures. A table showing the average composition of each kind of feed analyzed and introductory matter dealing with the administration of the State feed law are also included.

Commercial feeding stuffs registered for sale in Texas, October 1, 1919, F. D. Fuller (*Texas Sta. Bul. 252 (1919), pp. 5–304, figs. 2*).—This bulletin consists mainly of a list of manufacturers and dealers (classified by city and State) registered to sell feeding stuff in Texas, together with the names of the brands offered for sale and the manufacturer's guaranty as to the composition of each.

Feeding stuffs, H. T. Cranfield (*Midland Agr. and Dairy Col., Rpt. Feeding Stuffs and Fert., 1914–1918, pp. 5–25, pl. 1*).—The author reports proximate analyses of bran, shorts, middlings, wheat germ meal, rolled oats, corn meal, corn germ meal, corn gluten feed, rice meal, and the following "cakes": Linseed, cottonseed (Egyptian and Bombay), hempseed, palm kernel, rape, coconut, peanut and soy bean.

A number of compounded cakes and meals classified according to purpose as designated by the manufacturer are entered on a two-dimensional chart, protein percentages being used as abscissa and the fat percentage, as ordinates. As mapped out the areas of the different classes overlapped markedly.

Merino history and Merino breeding, S. M. CLEAVER (*Delaware, Ohio: Author, 1918, pp. 48, figs. 36*).—The author gives a short account of early importations of Merino sheep into the United States and a history of the development of the three types.

Annual wool review for 1916, 1917, and 1918, W. J. BATTISON (*Bul. Natl. Assoc. Wool Manfrs., 47 (1917), No. 1, pp. 1–61, pl. 1; 48 (1918), No. 1, pp. 1–63, pl. 1; 49 (1919), No. 1, pp. 1–67, pl. 1*).—These are the customary yearly reports giving statistics of domestic wool production, importations of wool, and wool prices in the United States, together with comprehensive summaries of the wool trade in other countries.

The Australasian wool trade: Annual review and statistics, season 1918–19, DALGETY & CO. LTD. (*Dalgety's Ann. Wool Rev. Australasia, 25 (1919), pp. 60*).—This is a statistical review of the wool markets of Australasia, with notes on the international wool trade. The topics discussed include the character of the Australian and New Zealand clips, the wool exports of the Australian Commonwealth, a comparison of record prices, Great Britain's wool position, the wool industry of the United States following the armistice, the wool markets of South Africa, and suggestions for preparing the clip.

Egg-weight as a criterion of numerical production in the domestic fowl, P. HADLEY (*Amer. Nat., 53 (1919), No. 628, pp. 377–393, fig. 1*).—This is a more extended discussion of material already noted from a preliminary paper (E. S. R., 41, p. 274). It is stated that the complete data will be published later. The records are those of 38 White Plymouth Rocks hatched in 1909.

The cost of producing eggs on a one-man poultry farm in New Jersey for 1919, V. G. AUBRY (*New Jersey Stas., Hints to Poultrymen, 8 (1920), No. 4, pp. 4*).—The author tabulates by months the average records of egg production, feed consumption, cost items, and financial returns on several (apparently about 10) one-man poultry farms in New Jersey for the year ended October 31, 1919. A summary for the year of the results on the most successful farm and the average farm are also given. The present report is more detailed than that for 1917–18 (E. S. R., 41, p. 77) and includes all laying birds on the farms considered, whereas the previous year's records, it is now stated, were from selected pens.

The average farm flock consisted of 970 birds with a mean production of 126 eggs (percentage production 34.4). During the year the average consumption of mash was 41.5 lbs. and of scratch feed 37.3 lbs. Allowing 5 per cent for depreciation and 4 per cent interest on investment the average labor income per bird was $3.50.

How to break eggs for freezing (*U. S. Dept. Agr., Dept. Circ. 74 (1920), pp. 12, figs. 10*).—A series of simple illustrated directions for the use of egg breakers in a frozen-egg plant.

Belgian hares as meat producers, F. L. WASHBURN (*Minn. Agr. Ext. Spec. Bul. 37 (1919), pp. 12, figs. 5*).—Directions are given for keeping Belgian hares or other breeds of large-sized rabbits as a family source of meat, together with notes on killing, dressing, and cooking.

Cavy culture, E. MICHAELS (*Philadelphia: Author, 1920, pp. 72, figs. 32*).—This pamphlet gives practical instructions for raising and marketing guinea pigs, with notes on the guinea pig as a source of food and fur.

DAIRY FARMING—DAIRYING.

Inheritance of quantity and quality of milk production in dairy cattle, W. E. CASTLE (*Proc. Natl. Acad. Sci., 5 (1919), No. 10, pp. 428–434*).—The author tabulates the first and in some cases the second lactation records of 31 Holstein×Guernsey F_1 heifers, and of 24 registered Holstein and 7 registered Guernsey dams of these cross-breds. The crossing was begun in 1911 by the late T. J. Bowlker on his farm at Framingham, Mass., as a definite experimental attempt to combine high milk production and high percentage of butter fat. It is stated that the project has been taken over by the University of Illinois.

During their first lactations (365 days or less) the cross-breds averaged 6,612 lbs. of milk, the Holsteins 7,673, and the Guernseys 4,617. The corresponding records during the second lactation were 8,663, 9,475, and 5,593. Butter fat tests were not taken systematically except in the case of the first lactations of the cross-breds, where the average fat percentage was 4.08 and the average yield 270 lbs. Eight of the Holsteins averaged 267 lbs. of fat during their first lactations. To provide a comparable figure for the Guernseys it is assumed that the fat test was 5 per cent, and on this basis the fat production was 231 lbs.

Milk produced in southern China, C. O. LEVINE (*Philippine Jour. Sci., 15 (1919), No. 1, pp. 91–105, pl. 1*).—The author presents some notes concerning the character of the dairy industry in southern China (vicinity of Canton and Hongkong), reports analyses of the milk of the water buffalo (*Bubalus bubalis*), the Chinese "yellow cow" (a variety of the zebu, *Bos indicus*), and descendants of improved European cattle, and describes the physical appearance of the native cattle, giving some body measurements of buffalo cows.

The ten samples of buffalo milk that were completely analyzed averaged 12.5 per cent of fat, 6.04 protein, 3.7 sugar, and 0.88 per cent ash. Monthly summaries of the milk and fat produced by buffaloes during four complete and a number of partial lactations are included.

"Buffalo milk is pure white, with absolutely no tint of yellow. Cream and butter made from it are rather oily and have but a faint tint of yellow. By mixing European cows' cream with the buffalo cream and using vegetable butter color the color and the texture can be greatly improved."

Dairy industry around Coimbatore, D. ANANDA RAO (*Agr. Jour. India, 14 (1919), No. 2, pp. 265–274, pls. 2, fig. 1*).—The author gives a brief account of the native trade in curds and ghee in the Kangayam region of Madras, and a more extended treatment of the creamery business which is a recent development and somewhat speculative in nature. The dairy animals are practically all buffaloes. There is a local breed of zebu-like cattle excellent for draught purposes but giving very little milk.

Statistics relative to the dairy industry in New York State (*N. Y. State Dept. Farms and Markets, Agr. Bul. No. 118 (1919), pp. 32, pl. 1*).—This publication is a report of a census by the State Department of Farms and Markets, and gives for each city or other community of over 200 inhabitants an estimate of the amount of fluid milk consumed in 1918, the number of concerns engaged in distributing this milk, and the number of cows from which it was derived. The total amounts of each kind of dairy products manufactured in the State in 1918 are also tabulated from the records of the Bureau of Markets of the U. S. Department of Agriculture.

The total number of milk-producing cows was found to be 1,023,034 and the average production 4,337 lbs. of milk per head per year. Slightly more than half the milk was marketed for direct consumption. There were 1,742 establishments engaged in shipping milk or manufacturing milk products, and a map showing their distribution throughout the State is included.

Preliminary report of the Council of Farms and Markets of its investigation of the cost of production and distribution of milk in New York State, W. E. DANA [*N. Y. State*] *Council Farms and Markets Invest. Cost Prod. and Distrib. Milk, Prelim. Rpt. 1919, pp. 29; also in N. Y.* [*State*] *Dept. Farms and Markets, Foods and Markets, 2* (*1919*), *No. 13, pp. 3–18*).—This preliminary report to the legislature consists of a summary of cost data collected by the Committee on Milk of the New York State Council of Farms and Markets, and two appendixes giving further details of the investigation, one dealing with production and the other with distribution.

The production costs were secured from 30 herds furnishing milk for sale in seven eastern New York cities (excluding New York City but including Poughkeepsie) and covered the year ended September 30, 1918. The average number of cows on a farm was 17.5 and the average production per cow 6,628 lbs. To produce 100 lbs. of milk required 35 lbs. of grain, 53.4 lbs. of hay, 4.7 lbs. of other dry forage, 105.8 lbs. of silage, 2.8 lbs. of other succulence, and 2.6 hours of man labor. The cost of these items was $2.82. The miscellaneous costs totaled $1.10 and the returns other than milk 48 cts. The net cost was thus $3.44. A managerial charge was not included. Similar computations of the costs per cow are also given.

The data as to distribution costs were furnished by 26 retailers in 10 of the up-State cities and in general covered the month of January [1919?]. The average amount of milk handled daily per plant was 2,731 qt. The distributors received 12.7 cts. per quart and paid producers 8.9 cts. Marketing costs averaged 2.8 cts. and the profit was approximately 1 ct. a quart. The distributing costs of 12 concerns, mainly occupied with retail trade, was 4.94 cts. per quart. It is held that more efficient management would reduce the costs of retailing milk.

A study of the New York City milk problem, I. G. JENNINGS (*New York: The Natl. Civic Federation, 1919, pp. 58*).—This pamphlet, accepted by Columbia University as a dissertation for the doctorate, deals with inefficiencies or supposed inefficiencies in the production, distribution, and sanitary control of milk destined for domestic consumption in New York City, and discusses possible remedies for the conditions asserted to exist.

Information as to conditions in the producing centers was derived mainly from 25 replies (duly tabulated) by superintendents of creameries or shipping stations to a questionnaire calling for data on the size of each patron's farm, and, for a given day, the number of cows he milked, the amount of milk he sent to the station, and the means employed to get it there. Data as to 32 milk routes secured from distributors' records and by interviews with drivers are also tabulated, and the points of conflict between dealers and the board of health are outlined. That the consumers themselves are responsible for some inefficiencies, particularly in delivery, is recognized, but it is argued they should not be expected to pay a price for milk high enough to include a profit on the unbusiness-like producing and distributing methods which the author believes he has demonstrated.

As remedial measures, the possibilities of regulation by a State commission and of public ownership of the milk industry are both discussed, and court decisions are cited to show that few legal difficulties stand in the way of either. However, the author is plainly distrustful of such devices, since "the function of government is not business," and puts his faith in what he calls natural cooperation between the parties concerned, with a minimum of interference from governmental agencies.

Milk cost survey for the week November 26 to December 2, 1917 (*Baltimore: Md. Council Defense, 1917, pp. 42, figs. 2*).—Detailed data are presented showing the cost of producing milk in ten Maryland counties during the week specified. Ten herds in each county were selected and the county agents cooperated in securing accurate records. Distribution costs of 29 retailers in Baltimore and other cities are also summarized. The record forms used in the survey are reproduced.

Milk cost survey for the week August 19, 1918, to August 25, 1918 (*Md. Agr. Col. Ext. Bul. 15 (1918), pp. 10*).—This second survey was undertaken to secure data as to summer costs of milk production for comparison with the preceding. The same herds were covered, with the addition of 10 from another county.

Is milk distribution a municipal function? D. W. HYDE, JR. (*Natl. Munic. Rev., 8 (1912), No. 8, pp. 532–534; also in Milk Dealer, 9 (1920), No. 5, pp. 10, 12, 14*).—Cases are cited of rigorous control and even operation of the retail milk business by English municipalities during the war with results satisfactory to consumers and producers. An important purpose of the control was to secure equitable distribution in times of shortage. The author would like to see similar schemes tested in this country.

Surplus milk (*U. S. Dept. Agr., Bur. Anim. Indus., Milk-Plant Letter 64 (1919), pp. 2; also in N. Y. Prod. Rev. and Amer. Creamery, 48 (1919), No. 11, p. 546*).—Replies are summarized to a questionnaire sent by the Dairy Division to milk dealers in four cities requesting data as to the relation of amount of milk received to volume of sales during each month of 1918. Throughout the year Boston dealers sold 64 per cent of their receipts as market milk, Philadelphia dealers 83 per cent, Pittsburgh dealers (where much condensed milk was manufactured) 44 per cent, and Detroit dealers 82 per cent.

Milking machines and the production of clean milk, T. ORR (*Pub. Health [London], 33 (1920), No. 6, pp. 85–92*).—The author describes the mechanical parts and method of operation of several types of milking machines used in Great Britain, discusses the associated bacteriological problems, and gives a list of 34 bibliographical references.

Reports on the keeping and carriage of milk in ventilated and unventilated churns, respectively, J. GOLDING, E. C. V. CORNISH, and R. S. WILLIAMS (*Jour. Bd. Agr. [London], Sup. 19 (1919), pp. IV+32*).—Bacteriological studies are reported showing insanitary conditions in milk transported in the antiquated milk can—still used to some extent in England—that is provided with ventilating holes in the lid. A special type of ventilated "churn" admitting filtered air was also tested, and it was found that such air was without beneficial influence on either the acidity or the bacterial content of the milk. It is concluded that the remedy for so-called cow smell is not ventilation in transit but the introduction of clean milking methods and modern cooling devices.

Some characters which differentiate the lactic acid streptococcus from streptococci of the pyogenes type occurring in milk, J. M. SHERMAN and W. R. ALBUS (*Jour. Bact., 3 (1918), No. 2, pp. 153–173, figs. 4*).—A study is reported from the Pennsylvania Experiment Station of 50 cultures of the true lactic-acid streptococcus and 50 of the pyogenes group of streptococcus isolated from milk in order to discover, if possible, easily recognized diagnostic differences between the two groups.

Differences were noted in chain formation and in ability to coagulate milk and to produce fermentation, but what is considered the most useful test is based upon marked differences in capacity to reduce stains. *Streptococcus lacticus* reduced methylene blue, litmus, and indigo carmine very promptly, while the pyogenes group had no effect on the first named and decolorized the others very slowly and incompletely and only after curdling had taken place. It was also observed that all the cultures of lactic-acid bacteria grew at 10° C., while none of the other group developed at this temperature.

A lactose-fermenting yeast producing foamy cream, O. W. Hunter (*Jour. Bact., 3 (1918), No. 3, pp. 293–300, fig. 1*).—The author reports work at the Kansas Experiment Station leading to the isolation of a lactose-fermenting yeast which produces the hot-weather defect known as foamy cream.

The optimum temperature for growth was found to be about 37° C., and the thermal death point 55° for ten minutes. The organism is resistant to desiccation, but is killed readily by calcium hypochlorite, lime, or cresol, though not by washing soda or boric acid.

Quantity and quality of New South Wales butter, 1917–1919, L. T. MacInnes (*Agr. Gaz. N. S. Wales, 30 (1919), No. 11, pp. 791–795, pl. 1, fig. 1*).—Statistics and graphs are presented showing the monthly amounts of butter manufactured in New South Wales during the two years ended June 30, 1919. Improved quality, particularly of export butter, is noted. Droughty conditions prevailing during the summer of 1918–19 caused a marked decrease in the output.

Investigations on Swedish Emmental cheese and large-holed Swedish farm cheese, L. F. Rosengren and E. Haglund (*Centbl. Bakt.* [etc.], *2. Abt., 45 (1916), No. 6–12, pp. 156–186*).—Previously noted from a Swedish source (E. S. R., 35, p. 483).

Review of the imported dairy produce trade for the year ended June 30, 1919, W. Weddel & Co., Ltd. (*Weddel's Ann. Rev. Imported Dairy Prod. Trade, 25 (1919), pp. 7*).—A statistical summary of imports of butter, cheese, and margarin into the United Kingdom.

VETERINARY MEDICINE.

Pathogenic microorganisms, W. H. Park and A. W. Williams (*Philadelphia: Lea & Febiger, 1920, 7. ed., rev. and enl., pp. X, 17–786, pls. 9, figs. 214*).—The principal revisions and additions in the seventh edition of this well-known text book (E. S. R., 38, p. 480) are as follows:

The whole subject of immunity has been rewritten, the revision of the chapter on complement fixation being contributed by M. A. Wilson and W. C. Noble. The chapter on media has been rewritten by B. v. H. Anthony to include the recent work on H-ion concentration. Extensive revisions have been made in the sections on streptococci, yeasts, and influenza bacilli. New material has been added on the bacteria pathogenic for the respiratory tract, and on preventive measures against typhoid and paratyphoid fevers and wound infections due to anaerobes.

Chemical structure and antigenic specificity.—A comparison of the crystalline egg-albumins of the hen and the duck, H. D. Dakin and H. H. Dale (*Biochem. Jour., 13 (1919), No. 3, pp. 248–257, figs. 4*).—The authors have found that the purified crystalline albumins from the eggs of the domestic fowl and duck behave as distinct antigens for the anaphylactic reactions in guinea pigs. Corresponding with this difference has been noted a distinct difference in the structure of the proteins, as shown by the fact that when the proteins are racemised the amino acids escaping racemisation are not identical in the two proteins.

"So far as they go, the results support the conception that the stereochemical structure of the protein molecule is at least an important factor in antigenic specificity. Without the information given by the racemisation method these two proteins would have been indistinguishable, except by an immunological test. The racemisation having shown a structural difference, the presumption that structure and antigenic specificity are related seems to be warranted. This conclusion, however, provides only a first step toward a conception of the relation between antigen and antibody. In due course it will be of interest to discover whether that protein of an immune serum which carries the specific 'antibody' action shows any difference of molecular pattern from the corresponding protein of a normal serum. Meanwhile the only kind of relation which seems to provide even a distant analogy is that of enzym and substrate; but the discrimination of the antibody is far more delicately specific."

A comparison between the precipitation of antitoxic sera by sodium sulphate and by ammonium sulphate, A. Homer (*Biochem. Jour., 13 (1919), No. 2, pp. 278–295, figs. 8*).—A further contribution to the method of concentrating antitoxic sera previously noted (E. S. R., 40, p. 288) is given in a comparison between anhydrous sodium sulphate and ammonium sulphate as precipitating agents, and in a study of the conditions regulating the preparation of satisfactory end products from the ammonium sulphate or from the sodium sulphate fractionation of unheated and of heat-denatured plasma.

In the precipitation of the serum proteins by sodium sulphate there were found to be no critical points marking the limits for the precipitation of the individual proteins. The percentage precipitation of the antitoxin at various concentrations of sodium sulphate was a linear measure of the percentage precipitation of the antitoxin-bearing proteins, and was undisturbed by the heat-denaturation of the serum proteins occurring during the heating of the adjusted plasma at 58° C. for four or five hours.

The concentration of either ammonium sulphate or sodium sulphate required for the precipitation was affected by the reaction and dilution of the plasma and by the addition of cresylic acid. Within the limits of error, the decreases in molecular concentration caused by these factors were practically identical for both substances.

By suitable fractionation of the unheated plasma, results were obtained similar to those with heated plasma. The exception was that the preliminary addition of cresylic acid proved disadvantageous, in that it reduced the proportion of antitoxin associated with the second fraction precipitates and led to the production of less readily filterable end products.

Sodium sulphate is considered a rather more satisfactory reagent than ammonium sulphate, in that the agglutination of the particles of precipitated protein in the euglobulin and pseudoglobulin zone is apparently more satisfactory. Since the sodium sulphate does not hydrolyze in solution, the first fraction mixtures can be heated for four or five hours at 58° without loss of antitoxin, resulting in the production of clearer end products than those obtained by heating in two stages as is necessary with ammonium sulphate.

A simple new method for the cultivation of anaerobic organisms.—Semiliquid media in bacteriology, J. Lignières (*Compt. Rend. Soc. Biol. [Paris], 82 (1919), No. 26, pp. 1091–1094*).—This supplements the report previously noted (E. S. R., 42, p. 379).

On methods of isolation and identification of the members of the colon-typhoid group of bacteria: Study of the bacteriological action of CR indicator, J. Bronfenbrenner, M. J. Schlesinger, and D. Soletsky (*Jour. Bact., 5 (1920), No. 1, pp. 79–87*).—A study of the bactericidal action of China blue and rosolic acid, a mixture of which is known as the CR indicator, is reported. The results indicate that China blue is inert toward both Gram-positive and Gram-negative organisms, while rosolic acid inhibits the growth of Gram-positive organisms only. The bactericidal power of CR is thus shown to be due entirely to the action of rosolic acid.

It is pointed out that the bactericidal properties of CR agree quite closely with those of various dyes of the triphenylmethane series as observed by Kligler (E. S. R., 39, p. 412) and others. Rosolic acid, however, differs from these dyes in that it alone does not inhibit the growth of *Bacillus dysenteriæ*. This difference is thought to render the CR indicator particularly suitable for the preparation of selective media to be used for the isolation of intestinal bacteria.

On the resistance to desiccation of the intermediate host of Schistosoma japonicum, W. W. Cort (*Jour. Parasitol., 6 (1919), No. 2, pp. 84–88*).—"The resistance to desiccation of *Blanfordia nosophora*, the intermediate host of the Japanese blood fluke (*S. japonicum*), is limited to about three months. Desiccation unfavorably affects the cercariæ within the snails, and infected snails succumb more quickly than uninfected. Individuals of *B. nosophora* will voluntarily leave the water and become dry under unfavorable conditions. Measures for the control of Japanese schistosomiasis by draining the breeding places of *B. nosophora* would be fully effective only if these places were kept dry at least three months."

Sclerostomes of the donkey in Zanzibar and East Africa, C. L. Boulenger (*Parasitology, 12 (1920), No. 1, pp. 27–32, figs. 5*).—Studies of collections of nematodes from the donkey have led to the identification of nine species, namely, *Strongylus vulgaris*, *S. edentatus*, *S. asini* n. sp., *Triodontophorous intermedius*, *Cylicostomum auriculatum*, *C. coronatum*, *C. bicoronatum*, *C. alveatum*, and *C. adersi* n. sp.

Weeds poisonous to live stock, P. R. Talbot and J. C. Cooper (*Alberta Dept. Agr., Prov. Schools Agr. Bul. 1 (1919), pp. 40, pls. 4, figs. 15*).—This descriptive account gives the information required for the identification of the most injurious and poisonous weeds found in Alberta, which cause heavy losses of live stock annually, methods of handling to prevent stock from eating these weeds, and the symptoms and treatment of animals affected. Colored plates of tall larkspur (*Delphinium glaucum* or *D. brownii*), death camas (*Zygadenus venenosus*), water hemlock (*Cicuta maculata*), and white loco weed (*Oxytropis lamberti*) are by N. Criddle.

Live stock sanitary department of Alabama, C. A. Cary (*Ann. Rpt. Commr. Agr. and Indus. [Ala.], 1918, pp. 62–70*).—This is the report of the State veterinarian and secretary of the Live Stock Sanitary Board on the work with eradication cattle ticks, work with tuberculosis, hog cholera, blackleg, and hemorrhagic septicemia, and the control of the hog louse.

Report of the bureau of animal industry, D. W. McLaury, J. G. Wills, and C. Linch (*N. Y. State Dept. Farms and Markets, Ann. Rpt., 1 (1918), pt. 1, pp. 72–104, pls. 8*).—This report includes accounts of work with infectious diseases of animals, and contains maps showing the extent for the fiscal year ended June 30, 1918, of tuberculosis, glanders, rabies, hog cholera, anthrax, blackleg, actinomycosis and hemorrhagic septicemia, infectious anemia, and mange.

Deficiency diseases, C. A. Cary (*Jour. Amer. Vet. Med. Assoc., 56 (1920), No. 6, pp. 609–614*).—In this paper, presented at the annual meeting of the American Veterinary Medical Association at New Orleans in November, 1919, the author discusses the similarity between the deficiency diseases of human beings and certain animal diseases.

The clinical symptoms of polyneuritis gallinarum and infantile beriberi are shown to follow closely posterior limb paresis of swine, a disease occurring in swine fed on corn or peanuts alone. Sore mouth or black tongue in dogs is considered suggestive of acute pellagra in man. Osteomalacia or creeping sickness of cattle, which occurs along the coastal plain region during the dry season, is compared with rickets, and it is shown that the disease occurs during a time when the cattle, owing to the lack of young grass, are suffering for fat-soluble A, lime, and phosphates. It is pointed out that pigs, dogs, cows, and horses may have scurvy, which is probably associated at times with rickets in pigs and pups and with osteomalacia and osteoporosis in mature cattle and horses.

Attention is called to the fact that in some southern States where hogs are fed largely on velvet beans there are many cases of abortion. It is suggested that many cases of so-called contagious abortion may be due to overfeeding cottonseed meal or some other unbalanced feed.

A note on sodium morrhuate in tuberculosis, L. ROGERS (*Brit. Med. Jour., No. 3032 (1919), pp. 147, 148*).—The author reports that the sodium salts of the fatty acids of cod liver oil, termed sodium morrhuate, have been used with considerable success in the treatment of tuberculosis in the same way that the sodium salts of chaulmoogra oil have been used in the treatment of leprosy.

The chemotherapeutics of the chaulmoogric acid series and other fatty acids in leprosy and tuberculosis.—I, Bactericidal action; active principle; specificity, E. L. WALKER and M. A. SWEENEY (*Jour. Infect. Diseases, 26 (1920), No. 3, pp. 238–264*).—This investigation, which was undertaken partly to confirm the therapeutic claims for chaulmoogratės and morrhuates noted by Rogers in the above article, includes a study in vitro "of the antiseptic and bactericidal actions of chaulmoogra oil and its constituents, the identification and isolation of the bactericidally active substance of chaulmoogra oil, the determination of the specificity of its bactericidal action for acid-fast bacilli, and an investigation of the presence or absence of this bactericidal substance in cod liver and other oils."

The fatty acids of the chaulmoogric series, chaulmoogric and hydnocarpic acids and possibly lower isomers of this series, were found to possess a specific bactericidal activity toward the acid-fast bacteria one hundred times greater than phenol, but to be inactive against all other bacteria tested. This specific activity appeared to be a function of the carbon ring structure the molecules of the chaulmoogric series. The fatty acids of cod liver oil, the salts of which constitute Rogers' sodium morrhuate, did not possess the specific bactericidal activity of the chaulmoogric acid series.

"Experiments on animals are now in progress to determine whether or not the chaulmoogric acid series have any practical value in the chemotherapy of tuberculosis."

Vaccination against anthrax virus with nonspecific substances, R. TURRÓ (*Compt. Rend. Soc. Biol. [Paris], 82 (1919), No. 26, pp. 1085, 1086; abs. in Vet. Rev., 4 (1920), No. 1, p. 58*).—The author reports that beaten egg forms an excellent medium for the growth of the anthrax bacillus, but that if 0.5 per cent ammonia be added to the egg and evaporation prevented the material has a strong bacteriolytic power for the organism. The name oviserum has been given to the bacteriolytic substance. Experiments are cited which show that rabbits strongly immunized with oviserum are immune to anthrax virus, and that the serum of such animals has a much higher bacteriolytic power than normal serum.

The nature of the mallein reaction and the hereditary transmission of glanders antibodies, E. BERTETTI and G. FINZI (*Atti R. Accad. Lincei, 5. ser., Rend. Cl. Sci. Fis., Mat. e Nat., 27 (1918), II, No. 11–12, pp. 372–379*).—In continuation of the study of glanders immunization and the mallein reaction (E. S. R., 38, p. 379), the authors report a study of the hereditary transmission of glanders antibodies. Nine foals born of dams affected with glanders, two in the course of hyperimmunization, one showing specific signs of nasal glanders, and three controls born of healthy dams were tested by the agglutination, complement deviation, and mallein tests. The controls gave negative results in every case, while the others gave positive agglutination and complement deviation tests and negative mallein tests.

These results are considered not only to indicate that glanders antibodies pass through the placental membrane, but also to confirm the authors' theory that the existence of antibodies does not suffice to explain the reaction to mallein.

A contribution to the study of the heredity of rabies, P. REMLINGER (*Ann. Inst. Pasteur, 33 (1919), No. 5, pp. 375–388*).—A review of the subject in which reference is made to the studies of Konradi (E. S. R., 17, p. 408; 36, p. 383).

Experimental streptococcus empyema: Attempts at prevention and therapy by means of vaccines and serum, F. P. GAY and R. L. STONE (*Jour. Infect. Diseases, 26 (1920), No. 3, pp. 265–284*).—This investigation, while undertaken chiefly from the point of view of human stereptococcus empyema, is considered to have some bearing "on the general question of streptococcus immunity, and particularly as indicating the possibilities of specific prevention or therapy of localized streptococcus infections of the empyema type."

It was found possible to produce a characteristic and fatal empyema in rabbits by the direct injection into the pleural cavity of from 0.1 to 0.2 cc. of a passage culture of a human strain of streptococcus carried through the pleural cavity of several animals. The experimental empyema produced is said to resemble the human form except that initial bronchopneumonia was not produced. The infection, while rarely becoming generalized, was invariably fatal in about five days.

"Experimental streptococcus empyema in rabbits may be prevented by previous immunization with killed, followed by living, cultures of the same strain of streptococcus, but only when repeated vaccinations have been practiced and in a total amount which would seem to preclude the practicability of such a preventive inoculation in human beings, provided the conditions are similar.

"The serum of rabbits that have been successfully immunized against subsequent intrapleural infection with the streptococcus contains potent antibodies, particularly agglutinins, opsonins, and precipitins. . . . The more potent of these antisera from rabbits when injected simultaneously with the culture into the pleural cavity may prevent the evolution of the otherwise invariable and fatal empyema. In a few instances subsequent injection of serum into the pleural cavity, or even intravenously, has cured the empyema. No very optimistic conclusion on the practical use of an antistreptococcus serum in this type of localized infection can be drawn from our experiments as hitherto conducted. Attempted vaccine therapy of the localized empyema has given consistently negative results."

Mycosis of the bovine fetal membranes due to a mold of the genus Mucor, T. SMITH (*Jour. Expt. Med., 31 (1920), No. 2, pp. 115–122*).—"A mucor. closely resembling Lichtheim's *Mucor rhizopodiformis*, was isolated from the diseased chorion of a cow and from the lungs and digestive tracts of the fetus. No other microorganisms were detected. The mucor was demonstrated in teased preparations from the fresh cotyledons as well as in sections of tissues suitably hardened. It produced focal lesions in rabbits following the intravenous injection of spores. The condition of the amniotic fluid and the contents of the rumen of the fetus justify the inference that premature expulsion was impending."

Eradication of the cattle tick, J. Bagué (*Porto Rico Dept. Agr. and Labor Sta. Circ. 18 (1919), [Spanish Ed.], pp. 12, pl. 1, figs. 2*).—This is a popular account of Texas fever and the cattle tick and methods of eradication in Porto Rico, including plans for a concrete dipping vat taken from Farmers' Bulletin 498 previously noted (E. S. R., 27, p. 579).

Bacterium anatum n. sp., the etiologic factor in a widespread disease of young ducklings known in some places as "keel," L. F. Rettger and M. M. Scoville (*Jour. Infect. Diseases, 26 (1920), No. 3, pp. 217–229*).—The authors describe a disease first noted in young ducklings in the spring of 1918. The disease, which is of wide distribution and high mortality, resembles bacillary white diarrhea of chicks. The symptoms are noticeable soon after hatching. The affected individuals appear weak and sluggish and have an intense thirst. The name "keel" has been given to the disease from the fact that, after drinking, some of the ducklings drew themselves to full height, staggered for a few seconds, keeled over, and died. The infection causes no lesions or any other pathologic condition with the exception of paleness of the tissues and light body weight.

From the internal organs of the dead ducklings there has been isolated an organism which has been given the name *B. anatum* n. sp. "While *B. anatum* resembles *B. pullorum* in several particulars, it is more closely related, in so far as morphological, cultural, and fermentation properties are concerned, to *B. paratyphosus* A and B, and to *B. enteritidis*. Its agglutination reactions link it most closely with *B. paratyphosus* B; also its alkalinizing action in milk. Of the different organisms which have been used in the comparative study, namely, *B. typhosus*, *B. paratyphosus* A and B, *B. enteritidis*, *B. pullorum*, and *B. sanguinarium*, *B. anatum* resembles *B. typhosus* least and *B. paratyphosus* B most.

"The organism was obtained in pure culture also from ovarian cysts and from an abdominal cyst of breeding ducks on a large commercial duck farm which was very seriously affected by the duckling disease. It appears quite probable, therefore, that the disease is transmitted from the breeders through infected eggs in the same way as bacillary white diarrhea has been demonstrated by Rettger et al. [E. S. R., 41, p. 880] to have its source in the ovaries of infected hens. Proof of such relationship in the duckling disease is, however, still lacking, owing to our inability to procure the necessary materials for a more extensive study of this point. It is planned to resume this phase of the investigation with the appearance of the next breeding season."

Pigeon diseases and feeding management, E. J. W. Dietz (*Chicago: Author, 1919, pp. 78, pl. 1, figs. 17*).—A popular account.

RURAL ENGINEERING.

Philippine water supplies, G. W. Heise and A. S. Behrman [*Philippine*] *Bur. Sci., Dept. Agr. and Nat. Resources, Pub. 11 (1918), pp. 218, pls. 19, figs. 2*).—This report deals with the water supplies of the Philippine Islands for domestic and industrial use.

It is noted that the surface wells of the Philippines are generally very near to human habitations, and are for the most part constructed in an insanitary manner. Practically every open surface well examined was found to be dangerously polluted. Spring waters were usually found to be bacteriologically pure at the point of emergence, and are, on the whole, considered to be excellent sources for household use. The deep well waters were found, as a rule, to be more highly mineralized than the spring waters, but biologically they were found to be very satisfactory, and are considered to be the most desirable sources of drinking water available in the Philippines for general use at the present time.

Further sections of the report deal with methods of storage and distribution, methods of purification of domestic supplies, waters for industrial use, and methods of water examination, including interpretation of analyses.

Report of the water conservation and irrigation commission for the year ended June 30, 1917 (*N. S. Wales, Rpt. Water Conserv. and Irrig. Comn., 1917, pp. 74, pls. 3*).—This is a report of the activities of the commission for water conservation and irrigation in New South Wales for the year ended June 30, 1917. Data are given on irrigation areas established and controlled by the State, irrigation schemes under consideration, water conservation works, artesian and shallow boring, and water conservation and irrigation works constructed by private parties.

Method of replacing old wooden flume with metal structure (*Engin. and Contract., 53 (1920), No. 6, pp. 164–165, figs. 4*).—The replacement of wooden flumes on an irrigation ditch in California with metal flumes is described and illustrated, showing progressive steps in the flume installaton.

River protective work, M. Paulsen (*New Zeal. Jour. Agr., 19 (1919), No. 5, pp. 271–276, figs. 3*).—Operations for the successful protection of farm land against a small river, by the use of groynes and the planting of willows in the river bed, are described.

Note on land drainage in irrigated tracts of the Bombay Deccan, C. C. Inglis (*Agr. Jour. India, 14 (1919), No. 5, pp. 781–786, pl. 1*).—Information on drainage practice is given indicating that conditions in the Deccan are excessively complicated, but that the problem is mainly one of preventive drainage. The damage is considered to be entirely due to the opening of canals. Sodium carbonate is almost entirely absent from the soils, while sodium sulphate and, to a less extent, sodium chlorid are present in great excess. In experiments to ascertain the permeability of soils and subsoils, the "posthole auger" method is advocated, in which permeability is measured by the rate of recuperation of subsoil water. The coefficient of recuperation is measured by the formula: $\frac{K}{A}=\frac{1}{T} \log. \frac{H}{h}$, where K=coefficient, T=time in hours, H=full head of depression, h=head of depression after T hours, and A=area of bore hole.

Public Roads (*U. S. Dept. Agr., Public Roads, 2 (1919), No. 18–19, pp. 43, figs. 27*).—This number of this periodical contains the following articles: Asphalt in Road Construction, by J. L. Goldberg; Some Points in Handling Materials; Material Must Be Moved Early; The Present Status of Impact Tests on Roadway Surfaces, by A. T. Goldbeck (see below); Growth of Federal Aid Work, by A. C. Bruce; Nearly $25,000,000 Allowed in Federal Aid in Two Months; Roads for Motor Truck Traffic, by C. J. Bennett; Motor Vehicles and the Highways, by W. D. Schier; and Traffic Census Shows Value of Paved Roads to Los Angeles, by J. C. Veenhuysen.

The present status of impact tests on roadway surfaces, A. T. Goldbeck (*U. S. Dept. Agr., Public Roads, 2 (1919), No. 18–19, pp. 19–24, 25, figs. 15*).—A progress report indicating the status of impact tests on roadway surfaces, being conducted by the Bureau of Public Roads, is given (E. S. R., 41, p. 689).

Considerable data and a number of curves are given showing test results obtained from a class B, 3 to 5 ton standard army truck, a 5½ ton truck, and a 1½-ton truck. These results in general show the maximum impacts that have been measured. They indicate that under certain conditions the impact pressure produced by heavy motor trucks is very large. The highest pressure thus far measured was in the neighborhood of 42,000 lbs. when the weight on the rear wheel causing this pressure was only 7,750 lbs., and the unsprung weight on one rear wheel was 1,837 lbs. With the 5½-ton truck, which has an unsprung weight of 1,000 lbs., it was shown that the impact pressures produced were very much smaller than in the case of the class B army truck. When the latter, with a total weight of 7,750 lbs. on one rear wheel, fell through a height of 2 in. at a speed of 15 miles per hour, the impact pressure produced was about 34,500 lbs. With the 5½-ton truck, loaded with 8,060 lbs. on one wheel and under corresponding conditions of speed and height of fall, the impact pressure produced was only 23,500 lbs., or 68 per cent of the impact pressure of the army truck. The unsprung weight of the 5½-ton truck was only 56 per cent of that of the army truck, but the gross load carried on the rear wheel was slightly larger. The indications are therefore that a light unsprung weight tends to lessen the impact of a truck on the road surface.

With the 1½-ton truck having a total weight of 3,470 lbs. on one rear wheel and 1,065 lbs. unsprung weight on one rear wheel, the impact pressure at a speed of 15 miles per hour and a height of fall of 2 in., was about 14,000 lbs. It is noted that the unsprung weight of this truck is practically the same as that of the 5½-ton truck, and the impact pressure produced is very much lower. This is taken to indicate that unsprung weight does not alone influence the impact pressure produced on the road. When questions of road design are to be considered, it is concluded that the actual wheel pressure on the road is the all-important factor rather than the gross load of the truck.

In the results obtained thus far the impact on the road varied with some power of the speed, this power being less than 2 and extending down as low as 1. The tests indicate that impact does not vary directly as the height of fall, the reason being that the action of the springs of the vehicles gives the unsprung weight an acceleration above that due to gravity. The amount of spring deflection at the instant the impact occurs is another factor influencing the amount of impact. Further tests are in progress, particularly tests to determine the effect of impact on road surfaces.

1920 program shows New York highways 67 1/2 per cent concrete (*Engin. News-Rec., 84 (1920), No. 6, p. 290*).—Data issued by the New York State Highway Department are reported, showing that out of a total of 725 miles of highway to be constructed during 1920, approximately 500 miles, or 67.5 per cent of the total, are listed as concrete highways. Bituminous macadam is second with 139 miles, and 38 miles of highway are to be constructed of one or both of the foregoing types.

Should "binding steel" be used in concrete highway? W. C. CONGER (*Concrete [Detroit, Mich.], 16 (1920), No. 2, pp. 77–79*).—A brief analysis is given indicating the important factors in the use of reinforcing in concrete roads, in which the author apparently advocates the use of mesh reinforcing. It is recommended that every State construct a section of unreinforced and a section of reinforced concrete road, side by side, for comparative test.

Use of slag as coarse aggregate on Elkhart-Osceola road, C. GRAY and F. KELLAM (*Concrete Highway Mag., 4 (1920), No. 2, pp. 27–29*).—Experiments on the use of slag in concrete for road construction are reported, including especially compression and wear tests. The results are taken to indicate that the resistance to wear and the compression strength are unusually high for field concrete made under the conditions of the test, and constitute a distinct recommendation for slag as a concrete highway material when properly selected and used.

Effect of fineness of cement on quality of concrete, D. A. ABRAMS (*Concrete [Detroit, Mich.], 15 (1919), No. 5, pp. 189–196, figs. 12*).—Four years' studies on the subject are reported as conducted at the Lewis Institute, in which 51 different samples of Portland cement were ground to different degrees of fineness, giving residues ranging from 2 to 43 per cent on the standard 200-mesh sieve. In general, the aggregate consisted of sand and pebbles, although in one series blast furnace slag and burnt shale were used. The results of compression tests on 6,125 6 by 12 in. cylinders, of 9,000 compression and tension tests of mortar, and of several thousand miscellaneous tests made at ages of from seven days to one year are reported.

No necessary relation between the strength of concrete and the fineness of the cement was established, if different cements are considered. In general, the strength of concrete increased with the fineness of a given lot of cement, for all mixes, consistencies, gradings of the aggregates, and ages of concrete. For cements with residues higher than 10 per cent the strength of concrete varied approximately inversely as the residue on the 200-mesh sieve. Fineness of cement was more effective in increasing the strength of lean mixtures than rich ones, and in increasing the 7-day strength of concrete than at ages of 28 days to one year.

For the usual range of consistencies the effect of fineness was independent of the consistency of the concrete. The rate of increase in strength with fineness was lowered for very wet mixtures. The principal result of finer grinding was to hasten the early hardening of the concrete. The normal consistency of cement increased with fineness, but the time of setting and the unit weight of cement decreased. The fineness of cement had no appreciable effect on the yield or density of concrete. The change in length of concrete specimens stored in air or water was independent of the fineness of the cement and the consistency of the concrete. The lean concretes were slightly less affected than the rich mixtures. The type of aggregate had little or no influence on the relative effect of fineness of cement on the strength of concrete, but there was an intimate relation between the strength of the concrete and the water-ratio of the mixture. The lower the water-ratio, the higher was the strength, and vice versa.

The preservation of wood (*Pittsburgh: The Rodd Co.,* [*1919*], *pp. 48, pls. 10*).—This is a compilation of information in popular form on methods and materials for the preservation of wood.

The mechanical properties of Philippine bast-fiber ropes, A. E. W. King (*Philippine Jour. Sci., 14* (*1919*), *No. 6, pp. 561–655, pls. 5, figs. 2*).—Investigations primarily undertaken for the purpose of securing quantitative results on the mechanical properties of bast ropes, conducted by the Bureau of Science of Manila, are reported. It is noted that while these fibers have no great commercial significance, in the rural districts they constitute a cheap material for the manufacture of cordage that is sufficiently resistant and durable for agricultural and animal husbandary purposes. The averages of two series of tests are given, the one on air-dry specimens and the other on specimens that had been immersed in fresh tap water for 24 hours. The results are compared with tests with standard fiber cordage. A few results of tests of miscellaneous ropes made of material not coming under the classification of either bast or standard cordage fiber are also included. A primitive wooden rope-laying apparatus is described and illustrated.

It was found that dry rope made of *Gnetum* sp. bast, having a mean circumference of 18 mm., showed the highest maximum mean tensile strength of 11,100 lbs. per square inch. This value compares favorably with the values for F and G grades of abacá rope. Rope made of coir fiber, ranging in strength from 2,420 to 2,640 lbs. per square inch, gave the poorest results. Rope made of *Gnetum* sp., which had been immersed in fresh tap water for 24 hours, was the strongest of the immersed specimens. It is noted that wetting generally caused a slight decrease in the tensile strength of most bast ropes. The *Gnetum* sp. rope showed the greatest breaking length of the bast ropes, of 27,700 ft., which closely approaches the value of the various abacá ropes tested. Rope made of coconut fiber showed a breaking length inferior to most of the bast fiber ropes tested. The elongation of bast fiber ropes was generally less than that of most standard cordage fibers, and wetting increased the mean elongation of nearly all of them. The minimum and maximum average elongations for dry and wet specimens were 6 and 16 per cent and 9 and 25 per cent, respectively.

How to remove keyed pulleys from a shaft, G. H. RADEBAUGH (*Power Farming, 29 (1920), No. 2, pp. 14, 15, figs. 15*).—Drawings and information are given showing the common styles of keys or methods of fastening pulleys to shafts in farm machinery, and information is given regarding practical methods of removing the pulleys.

Gasoline tractors, C. B. HAYWARD (*Chicago: Amer. Tech. Soc., 1919, pp. [V]+169+6, pls. 8, figs. 87*).—This is a semitechnical treatise on gasoline tractors and problems relating to their mechanism and operation. The following subjects are discussed: Classes of tractors, selecting a tractor, tractor motors, valves and valve timing, fuel supply system, lubricating system, cooling system, ignition system, types of ignition systems, types of motors, engine governors, tractor clutches, tractor transmissions, lubrication, and engine parts.

Some practical points in farm tractor design, J. C. WESTMONT (*Agrimotor, 3 (1919), No. 2, pp. 24, 25, fig. 1*).—The author summarizes his personal past experience with different designs of farm tractors. He concludes that the ultimate type of tractor will be the 4-wheel, 4-cylinder type with the motor set lengthwise of the frame and all gears operating in oil in dust-proof cases in both frame and frameless types.

Manganese steel in farm tractor manufacture, E. C. BAUER (*Agrimotor, 3 (1919), No. 2, pp. 27, 28*).—The progress of the use of manganese steel in the manufacture of farm tractor parts is summarized and its working qualities discussed. Comparative service tests from different sources are summarized, which were made on manganese steel, carbon steel, and forged steel tracks for crawler tractors. It is stated that the results of these tests have almost invariably shown the superiority of manganese steel.

Laboratory tests of the physical characteristics of manganese steel indicate a tensile strength of from 90,000 to 110,000 lbs. per square inch, an elastic limit of about 50,000 lbs. per square inch, an elongation in 2 in. or about 33 per cent, and a reduction of area of 35 per cent. It is stated that the metal does not become austenitic until about 6 per cent manganese and 8 per cent carbon are introduced. The price of manganese steel is said to be greater than that of carbon steel.

Wrought steel gear blanks for farm tractors, R. B. WOODWORTH (*Agrimotor, 3 (1919), No. 2, pp. 22, 23, figs. 5*).—The progress in the construction of tractor gears is reviewed, attention being called to the change from cast iron and steel to forgings. Data on the materials used for gears in some 150 different tractors manufactured in 1917 and 1918 showed an increase of from 24 to 42 per cent for carbon steel, a decrease of from 40 to 28 per cent for cast steel, and a decrease of from 23 to 13 per cent for semisteel.

What impulse starters have done for tractors, P. A. TANNER (*Agrimotor, 3 (1919), No. 2, pp. 20, 21, figs. 5*).—A description is given of the construction and operation of impulse starters, with particular reference to their use on farm tractor engines. It is stated that the impulse starter on the tractor makes starting of even the largest engines safe, sure, and easy.

The Nebraska tractor law and rules for official tractor tests, L. W. Chase, E. E. Brackett, O. W. Sjogren, and G. K. Shedd (*Nebraska Sta. Circ. 10 (1919), pp. 3–14, fig. 1*).—The text of the Nebraska tractor law is given, together with details of rules for official tractor tests, and the testing equipment at the University of Nebraska is described. The provisions of the law are as follows:

(1) A stock tractor of each model sold in the State must be tested and passed upon by a board of three engineers under State university management. (2) Each company, dealer, or individual who offers a tractor for sale in Nebraska must have a permit from the State Railway Commission, issued after a stock tractor of that model has been tested at the university and its performance compared with the claims made for it by the manufacturer. Temporary permits are provided before tractors are tested, good until the tests are made. (3) A service station with full supply of replacement parts for each model of tractor must be maintained within the State and within reasonable shipping distance of customers.

The complete test consists of the following parts: (1) Drawbar work at from one-third load to full load for 12 hours: This test gives opportunity for the tractor to "limber up." (2) Brake-horsepower test at rated load and rated speed for two hours: This test will show whether or not the tractor will carry its rated load on the belt; also show fuel consumption at rated load. (3) Brake-horsepower test at load varying from maximum to no load with all engine adjustments as in test (2) for one hour: This will show fuel consumption and speed control on varying load. (4) Brake-horsepower test at maximum load for one hour with governor set as in test (2) and carburetor adjusted to give maximum power: This will show the maximum horsepower of the tractor on the belt. (5) Brake-horsepower test at one-half load for one hour with governor set as in test (2) and carburetor adjusted for most economical operation at one-half load: This test will show fuel consumption at one-half load. (6) Drawbar horsepower test at rated load for 10 hours: This test will be made on a half-mile cinder track and will show whether or not the tractor will carry its rated drawbar load continuously; also show fuel consumption on drawbar work. (7) Maximum drawbar horsepower test: This test will be a series of short runs with an increase of load for each run until the engine is overloaded or the drive wheels slip excessively. (8) Miscellaneous: This may include investigation of work on inclines, turning radius, effectiveness of brakes, or any other feature of the tractor which may seem to require special observation. (9) Tractors will be under observation for endurance throughout the complete test as outlined above.

Report of tractor belt tests in Ohio, J. B. Green (*Farm Impl. News, 41 (1920), No. 7, pp. 26, 27, 41, fig. 1*).—Belt tests of 33 tractors, conducted by the department of agricultural engineering of Ohio State University, are reported.

It was found that the average amount of fuel used by all the kerosene-burning machines was 0.854 lbs. per horsepower-hour when pulling their rated load. On the same rated load tractors burning gasoline used 0.833 lbs. of fuel per horsepower-hour. The fuel consumed per horsepower-hour when developing the maximum horsepower was somewhat higher with gasoline than with kerosene.

An outstanding feature of the tests was the influence of the temperature of the cooling water upon fuel economy. The five tractors using the most fuel had an average radiator temperature of 160° F., while the five machines using the least fuel per horsepower-hour had a temperature of the cooling medium 19° higher, or 179°. The data sheets showing fuel used and temperatures for

10-minute intervals nearly always showed that a rise in the temperature of the cooling medium was accompanied by a corresponding decrease in fuel consumption.

All the tractors tested showed an average overload in their maximum tests of 18 per cent. The five tractors showing the greatest percentage of overload had an average of 55 per cent. The five tractors which tested in their maximum tests below their rating fell below less than 5 per cent. It is stated that, in general, all tractors performed well when on test.

Logging with belt tread tractors, C. D. METCALF (*Sci. Amer. Mo., 1 (1920), No. 1, pp. 42–44, figs. 5*).—Experience with the use of caterpillar tractors and trailers for use in logging operations in the Northwest is reviewed.

Motor tractor trials at Pusa, W. SAYER (*Agr. Jour. India, 14 (1919), No. 5, pp. 710–714, pls. 5*).—Tests of a 22-b. h. p. tractor with a drawbar pull of from 1,800 to 2,500 lbs. on typical oat stubble soil are briefly reported. The tractor was able to pull a double-furrow disc plow, which is pulled as a rule by three pairs of big bullocks, the engine running with a good reserve on second speed. Other results are reported in more or less detail.

The motor tractor in Great Britain (*Agr. Gaz. N. S. Wales, 31 (1920), No. 1, pp. 1–5*).—A summary of the results of an investigation of the working costs of farm tractors in Great Britain is given. It is stated that in estimating the running cost of a tractor, high-speed light tractors may be given a life of two years, while a 20-per cent depreciation may be allowed for low-speed heavy tractors.

Data on the approximate cost of plowing by tractor showed that the consumption of paraffin varies according to the resistance of the soil to draft. It has been found that spring connections between the plow and the tractor have proved unsatisfactory in England, and that hilly ground is unsuitable for tractor plowing. The speed at which the tractor travels has been found to influence the quality of the plowing, and for good work a speed of from 2½ to 3 miles an hour should not be exceeded. The farm tractor is unsuited for road haulage in England owing to the prevalent type of roads.

The economies of high speed tractor plowing, C. H. SPRAGUE (*Agrimotor, 3 (1919), No. 2, pp. 14, 15, figs. 3*).—The author briefly reports data from experience indicating the advantage of higher speed tractor plowing over low speed plowing.

It is noted that when plowing at a speed of from 3 to 3½ miles per hour, the soil is thrown over well pulverized and in a level condition. Fast plowing is more successful in completely turning under trash and weeds than slow plowing. In a clay loam soil with weeds from 2 to 3 ft. tall, fast plowing left the field level and well pulverized with weeds covered, while in slow plowing the pulverization was poor and the weeds were not covered.

Review of mechanical cultivation, M. RINGELMANN (*Bul. Soc. Encour. Indus. Natl. [Paris], 117 (1918), II, No. 5, pp. 275–297, figs. 14*).—A review is given of different experiments, conducted in France during 1917, on various aspects of mechanical cultivation.

Attention is particularly called to experiments on vineyard cultivation in different localities, in one case using a 10–20 h. p. tractor. On grapes and cereal crops it was found that the tractor with two men and a 3-furrow plow did as much work as five teams and five drivers in the same time. The conclusion is drawn that any tractor having an axle length equal to the distance between the vines minus 50 cm. (18.7 in.) can be used. It was found that the machine used turned easily on a headland from 4½ to 5 meters wide. Special attention is called to the importance, in purchasing a tractor, of seeing that any accessories projecting beyond the line of the wheels will allow the tractor to pass between the vines.

Further experiments on the estimation of the work of a power-farming machine lead to the deduction of the formula: $s=Klc$, in which s is the surface plowed, l is the width of plowing, and c, the distance traveled per unit of time. K is a coefficient covering losses in time, and varies from 0.64 to 0.71, with respective speeds forward during work of 1.5 and 0.8 meters per second.

Further experiments on reddish sand and silt soils almost entirely lacking in lime showed that where the soil conditions were good a cylindrical mold-board plow required an average traction of 6.4 lbs. per square inch, while a disc plow required an average traction of but 4.2 lbs. per square inch, giving an economy over the mold-board plow of about 38 per cent. In dry weather it was found that ordinary plows will penetrate these pebbly heavy soils with difficulty and that the shares are quickly ruined, but if sufficiently heavy a disc plow will always penetrate. If the soil is wet, the share penetrates easily, whereas the disc plow kneads the soil like mortar, doing damage. The disc plow, however, is considered generally preferable to the mold-board plow.

Experiments with planting cane sets by hand v. machine planting of same (*Ann. Rpt. Bur. Sugar Expt. Stas. [Queensland], 19 (1919), pp. 14, 15*).—These experiments showed that crop results from the machine method of planting were better than hand planting, both in manured and unmanured plats. The experiment is being continued.

Dusting machinery for cotton boll weevil control, E. Johnson and B. R. Coad (*U. S. Dept. Agr., Farmers' Bul. 1098 (1920), pp. 31, figs. 5*).—This publication is intended to aid the prospective purchaser of dusting machinery for cotton boll weevil control in selecting a satisfactory model and one adapted to the needs of his particular farming conditions. It also reports the progress of investigations being conducted in the design and development of dusting machinery, by the Bureau of Public Roads, as a guide to manufacturers.

In dealing with factors affecting machine construction, it is pointed out that every step toward simplifying the operation and maintenance of the dusting machine is a tremendous advance toward making it satisfactory and efficient, when the character of available labor is considered. It is particularly desirable that the operator be exposed to a minimum amount of dust. It is noted that in first tests of power dusters, from 15 to 20 lbs. of calcium arsenate per acre were required to treat cotton satisfactorily, but by improving the machinery so that the dust was broken up better and thus distributed over a larger area, it has been possible to reduce this dosage to about 5 lbs. per acre and secure the same satisfactory results.

With hand operated machines a considerable number of observations based on small areas have shown an average speed of operation of about 1 acre per hour per machine. Experiments to date have indicated, however, that the hand machine has a decidedly limited use. The treatment of areas over 50 acres with a number of hand machines has not proved practicable under most conditions, and it is concluded that the use of the hand machine will be limited to exceedingly small areas of cotton and as an adjunct to large machinery.

The power machines have proved fairly satisfactory, but the desirability of eliminating the engine has become so pronounced that the present tendency is to favor the wheel traction machines. These types are described in some detail. It is pointed out that dusting machinery for cotton poisoning is strictly in an experimental stage, and that it is to be expected that improvements will be developed from time to time for some years.

Plan and details for concrete cattle-dipping vat (*Nat. Builder, 63 (1920), No. 2, p. 59*).—These are working drawings.

Plans of grain elevators, C. S. CLARK (*Chicago: Grain Dealers Jour.*, [*1918*], *4. ed., pp.* [*IV*]+*XLVIII*+*426, pls. 2, figs. 906*).—This is the fourth edition of this book, containing what are considered to be the latest and best arrangements and construction for terminal storage, transfer, and cleaning elevators, together with plans of several hundred country elevators. Grain elevators of varying capacities and of many different types of materials and designs are included.

Loading test of 18-ft. circular concrete grain bin, P. J. HANSEN (*Engin. News-Rec.*, *84* (*1920*), *No. 7, pp. 316, 317, figs. 3*).—Experiments are reported on the behavior of grain bins, separated by tie walls, under outside pressure from grain in the interstices. The conclusion is drawn that a circular bin designed for grain pressure will safely stand the same pressure on the convex side, as on the concave side, but that the pressure per square foot should not exceed the pressure on the concave side.

Protection of potatoes from cold in transit—Lining and loading cars (*U. S. Dept. Agr., Farmers' Bul. 1091* (*1920*), *pp. 27, figs. 24*).—This bulletin is a revision of Bureau of Markets Document 17 (E. S. R., 40, p. 138), and explains successful methods of lining and loading potatoes in box cars, produce cars, refrigerator cars, and heater cars, based upon commercial practices and the results of tests and inspections. The specific lining and loading directions are designed primarily for cars with a heater in the doorway, unless otherwise specified.

It is stated that of 400 cars of northern potatoes examined during the winter of 1917–18, approximately one-fourth were lined and loaded correctly, while in the remaining three-fourths there was always the danger of overheating the potatoes at the top of the load and at the same time allowing the potatoes on the floor to freeze. It is also stated that it is comparatively simple for a heater to furnish enough warm air to protect a car of potatoes from freezing, even in severe weather. To accomplish this a complete air passage the full width of the car must be kept open around the load. In this connection attention is drawn to the following points: (1) The potatoes must not be loaded close enough to the ceiling to block any part of this circulation, (2) there must be a large, unobstructed opening for the warm air to pass down to the floor after it has spread the length of the ceiling from the heater, and (3) the false floor must be so constructed that this warm air can pass under it at all points back to the heater again. This circulation is slow and labored and is limited by the smallest opening in the space provided around the load, just as the effectiveness of a chimney is limited by the narrowest place in the flue. If the space around the load is partially blocked by the potatoes themselves, or by boards, shavings, or straw, the warm air will not circulate as it should.

Storage and diseases of the sweet potato in Texas (*Texas Sta. Bul. 250* (*1919*), *pp. 41, figs. 39*).—This bulletin discusses potato storage, harvesting, management of the potato house, curing and care of sweet potatoes in storage, storage period after curing, and diseases of sweet potatoes in storage, and, as a result of extensive studies made in sweet potato storage, by a committee consisting of J. J. Taubenhaus, E. A. Miller, H. M. Eliot, B. F. Brown, and A. K. Short, presents the details of the Texas A. and M. storage houses.

It is stated that this type of house has been given a severe test under adverse conditions and has proved very satisfactory. It is relatively low in cost of construction, is cheaply and simply operated, keeps potatoes with a minimum loss from rots, and gives them good shipping qualities. The house described is a 5,000-bu. house and is designed as a unit system. This unit house is advocated because in that unit of bulk it is possible to make use of all the natural conditions of ventilation, and, with proper management, to reduce the losses from rots to a minimum.

The dimensions of the 5,000-bu. house are 59 ft., 10 in., by 26 ft. by 11 ft., 4 in. The preponderance of length is designed to secure the maximum amount of ventilation. The house is built of lumber. this material having been thoroughly tested and found to give satisfaction. It is constructed on piers which extend about 2 ft. above ground, thus allowing the necessary floor ventilation. To protect the house against severe cold spells, outer drop-doors on the north and west sides reaching from the baseboard to the ground are considered desirable. Floor ventilators, windows, doors, and ceiling ventilators, any or all of which may be opened or closed when it is necessary to admit or exclude air currents, are distinct features of the house. A cupola is used for roof ventilation.

Another distinct and important feature of the house is the method of heating and air circulation, which is accomplished by means of a stove and flue. "The features of this system of heating is an opening under the stove, through which the out-door air enters from under the house. The air then passes around a jacketed stove, where it becomes heated and dried in contact with the stove. Since warm air is lighter, it will naturally rise to the ceiling and spread to all parts of the house. As it absorbs moisture from the inside air, it becomes cooler and heavier and falls to the floor, whence it escapes by suction through the bottom openings of the flue. By this method a constant and strong circulation of warm dry air may be maintained whenever damp or cold weather makes it necessary to keep windows and ventilators closed."

The bins are divided into four quarters, two above and two below, thus causing the potatoes to be in small bulk and facilitating the curing process. The bins are also raised above the floor to allow circulation of air from underneath. Provision is also made for storage in hampers, baskets, or crates, where it is not desired to store in bins. A loading platform is provided on the outside.

Thirty-two drawings showing the details of the house are included.

Harvesting and storing ice on the farm, J. T. Bowen (*U. S. Dept. Agr., Farmers' Bul. 1078* (*1920*), *pp. 31, figs. 30*).—This is a revision of Farmers' Bulletin 623 (E. S. R., 32, p. 591). It discusses sources of ice and methods of harvesting ice, and gives practical working data on the capacity, location, and construction of ice pits and ice houses. General specifications for various types of ice houses are included.

Rural plumbing, G C. Whipple (*Public Health Rpts.* [*U. S.*], *35* (*1920*), *No. 3, pp. 131–135*).This is a brief outline of rural sewage disposal problems.

Practical types of sanitary privies, C. W. Stiles (*Amer. Jour. Pub. Health. 10* (*1920*), *No. 1, pp. 48–52*).—The author concludes that the best kinds of privies for general use are the LRS and the chemical types. The advantage of the LRS type over the chemical lies in the lower cost as averaged over a period of from 5 to 10 years. Its disadvantages are that it requires the addition of water once a week and occasionally produces abnormal odors. The chemical system over the LRS is seemingly better suited for use inside the house, but when emptied there is sometimes a delay in recharging the vat with the proper chemical. It is stated that the chemical generally used has caustic soda as its chief ingredient.

Experiments showed that a 3-per-cent chemical killed the *Bacillus coli* content within 24 hours, and killed the eggs of hookworms and of Ascaris and the spores of Endamœba and Lamblia within a practical period of time. Further experiments with sodium dichromate in a strength of 4 gm. per liter of excreta showed this chemical to be a practical disinfectant in some chemical closets in warm weather. The adoption of sodium dichromate is not advised until experiments in cold weather have been performed. It is concluded that inspection, follow-up work, and better mechanical construction are factors of supreme importance in a sanitary-privy system.

Treatment and disposal of sewage, H. B. HOMMON, J. K. HOSKINS, H. W. STREETER, R. E. TARBETT, and H. H. WAGENHALS (*Pub. Health Rpts.* [*U. S.*], *35* (*1920*), *No. 3, pp. 101–131*).—Brief descriptions are given of methods, processes, and structures used in the treatment and disposal of sewage in the United States. A bibliography is included.

Fire control on the farm, H A. VON NIEDA (*Power Farming, 29* (*1920*), *No. 2. pp. 10, 11, 20, figs. 2*).—This is a popular report on methods and means of fire prevention on the farm. Fire extinguishing apparatus is described and its principles and operation explained.

RURAL ECONOMICS.

Agricultural economics, H. C. TAYLOR (*New York: The Macmillan Co., 1919, pp. X+439, figs. 24*).—This, one of the series of social science text-books edited by R. T. Ely, covers the economics of production and of marketing, and the problem of maintaining and improving the economic and social position of the farmer. Problems of land and land tenure, farm credits, equipment, management, labor, and wages, and the grades and proportions of these factors of production are discussed. That portion of the book relating to marketing is devoted mainly to the relations between the farmer and middleman and the difficulties of price fixing on the basis of cost of farm products. Social needs of farm life are outlined, and a survey of the importance of farm accounts and the historical, geographical, statistical, and experimental methods necessary in the investigation of agricultural problems concludes the volume. Much of the material included here has been noted from other sources (E. S. R., 17, pp. 95, 302; 37, p. 290; 39, p. 687).

What is rural economics? J. ISE (*Quart. Jour. Econ., 34* (*1920*), *No. 2, pp. 300–312*).—The author sets forth his view of the fallacy of combining rural economics and farm management. For the sake of academic standards he advocates the strict definition of the subject matter of the two, and the subdivision of the former into subjects such as land problems, marketing of farm products, rural credits, cooperation, and others.

The work of the Office of Farm Management and its relation to the agricultural experiment stations, H. C. TAYLOR (*Jour. Farm Econ., 2* (*1920*), *No. 1, pp. 45–55*).—In this article the outline of research work in farm management and farm economics and of methods of study, previously noted (E. S. R., 40, p. 890), is enlarged upon with the end in view of enlisting State aid in conomic investigations.

The application of investigational data to the reorganization of the arm, A. Boss (*Jour. Farm Econ., 2* (*1920*), *No. 1, pp. 36–44*).—Certain quesions most often asked by farmers in regard to farm organization and live tock problems, those of farm equipment, organization and utilization of farm abor, and of marketing are cited, and it is shown how the data for answering hem were reached and where they are available. The importance of careful ong-time investigation and the easy availability of accurate farm organization nformation is urged.

Determination of the profits of peasant agriculture, E. LAUR (*Landw. Jahrb. Bayern, 5 (1915), No. 2, pp. 95–113*).—Some simple accounting practices for determining the gross and net profits of the year's business on peasant farms are set forth here. The author, however, favors a double entry system of bookkeeping, and gives several formulas illustrating the distribution of costs among the separate branches of the business, and the determination of relative profitableness. He discusses, also, the relation of size of holdings, diversified and intensified systems of farming, the management of the business, and land classification to net profits.

Scottish agriculture during the war, C. DOUGLAS (*Trans. Highland and Agr. Soc. Scot., 5. ser., 31 (1919), pp. 1–66, figs. 3*).—This article gives an outline of the organization and activities of the Board of Agriculture for Scotland during the war. Tables given as the appendix, comprising statistics of acreage under crops and grass, numbers of various classes of live stock, and average prices of agricultural products, 1914–1918, with comparisons, were prepared by J. Wyllie from official and private sources.

Proceedings of the French Agricultural Congress (*Cong. Agr. Franç., 1919, Compt. Rend. Trav., pp. 65–120, 171–446*).—In these resolutions passed by this congress, held at Paris between June 30 and July 3, 1919, are outlined a plan of organization by which farmers in the devastated areas may quickly and efficiently be helped by the State to restore their agriculture, and also for a national federation of agricultural associations. Measures considered necessary for stabilizing the situation existing in regard to agricultural labor, including improvements in rural housing and living conditions, professional training for farm labor, encouraging disabled men to go back to the land, and developing suitable immigration, as well as for improving the agriculture of the French colonies, are presented.

Report of the fifth agricultural and cooperative conference, Burma (*Dept. Agr. Burma, Rpt. Agr. and Coop. Conf., 5 (1919), pp. 40*).—This report embodies general addresses on the economics of Indian agricultural production heard at the conference held at Mandalay, September 1–5, 1919. Accounts of the progress of cooperative agricultural enterprises, and resolutions of subcommittees on rural finance, insurance, and related matters are also given.

The salvation of the land, J. MÉLINE (*Le Salut par la Terre. Paris: Hachette & Co., 1919, pp. 272*).—This is a general discussion of land values, means of intensifying French agriculture, agricultural labor, insurance, and cooperation.

The world's food resources, J. R. SMITH (*New York: Henry Holt & Co., 1919, pp. [3]+634, figs. 144*).—This presents a study of physical, geographic, and economic facts of the world's food supply, also the possibilities of new areas or of those capable of more intensive cultivation, and discusses the adaptation of human consumption to new conditions of world production and trade.

The Illinois Agricultural Association and its job, E. DAVENPORT (*[Chicago]: Ill. Agr. Assoc., 1920, pp. 18, fig. 1*).—It is said that the aim before the association must be that of following, without making entangling alliances, a program covering the larger issues of agricultural development, such as better marketing facilities, credit systems available to all farmers, and more modern living conditions, while at the same time including the development of such local affairs profiting its individual membership as shippng associations, car facilities, improved retail service for farmers, and advice in methods of investment.

Farm bureaus and their job, E. DAVENPORT (*Successful Farming, 19 (1920), No. 3, pp. 10, 42, 182, 183, figs. 2*).—This has been essentially noted in the above.

New Town, edited by W. R. HUGHES (*London and Toronto: J. M. Dent & Sons, Ltd., 1919, pp. 141*).—A chapter on Agriculture in New Town in this "proposal in agricultural, industrial, educational, civic, and social reconstruction" advocates farming on the cooperative colony plan, also on small holdings and allotments, and discusses the educational and financial aspects of the development of agriculture for the good of the community.

Report of the Belgian Peasants' League, C. LUYTGAERENS (*Boerenbond Belge Exercise, 1918, pp. 102*).—Reports of the project previously noted (E. S. R., 42, p. 89) are continued for the year 1918.

Report on the working of the cooperative societies in the Punjab, M. L. DARLING (*Rpt. Work. Coop. Soc. Punjab, 1919, pp.* [5]+*5*+*23*+*II*+*4*).—This continues reports previously noted (E. S. R., 41, p. 94).

The cooperative grain industry in Russia, B. KOMAR (*Russ. Coop. News, 1-2 (1919-20), No. 7-1, pp. 11-14*).—This is the first of a series of articles intended to illustrate the cooperative hold on raw materials in Russia. The course of the development of cooperative marketing of grain is traced from the early form in local credit associations to the central coordinating organization of the grain trade in the "Southern Russian Cooperative Grain" and the "All-Russian Central Union of Consumers' Societies." General information regarding cooperative flour mills is also given. It is held that cooperatives have obtained a firm foothold in the grain trade of Russia so far as the domestic market is concerned, and we are sure to acquire a lasting hold in the export grain trade with the termination of the blockade and the opportunity to sell abroad.

Farmers' Market Bulletin (*North Carolina Sta., Farmers' Market Bul., 7 (1920), No. 32, pp. 24, fig. 1*).—This number contains an article on The Farmers' Interest in Good Seed, by J. L. Burgess, covering the importance of a perfect stand, relation of vitality to development and maturity, importance of clean seed, and cost of weed seeds, in addition to the usual partial list of field crops, fruits and vegetables, live stock, and miscellaneous produce which farmers have for sale or want to buy.

[Land tenure and agriculture in the Union of South Africa] (*Union So. Africa, Off. Year Book, No. 1 (1917), pp. 357-409, figs. 2*).—These pages give statistics and general information relating to the tenure and occupation of Crown lands, land settlement, registration of deeds, and extent of the irrigated area, also to live stock and pastoral production, including dairying and ostrich farming, agricultural production, agricultural cooperation, and the export and import trade in agricultural and pastoral products, mainly for the period 1910-16.

AGRICULTURAL EDUCATION.

Third annual report of the Federal Board for Vocational Education, 1919.—I, Vocational education; II, Vocational rehabilitation (*Fed. Bd. Vocat. Ed. Ann. Rpt., 3 (1919), vols. 1, pp. 256; 2, pp. 56, figs. 12*).—Volume 1 of this report for the year ended June 30, 1919, consists of three parts, viz, the progress and needs of vocational education, a summary of progress by States, and a statistical report.

It is shown that for 1919-20, 35 States have State funds for vocational education equal to or greater than the maximum allotment from Federal funds. Of the total fund allotted to the States for vocational agricultural instruction for 1917-18 approximately 50 per cent was expended, and for 1918-19 approximately 75 per cent. In 1918-19, 30 States employed full-time supervisors of vocational agriculture and 18 States part-time supervisors. In several States two or more supervisors of agriculture have been provided.

Attention is called to the need for a careful study of the method by which the best use can be made of the land and equipment of special or separate schools of agriculture; also of the best means of providing opportunities for supervised practical work in schools organized for pupils living in sparsely settled sections of the country where it is impossible to establish schools which will provide instruction to the pupils while they are still living at home. The problem of reaching the large group of boys who are engaged in the business of farming but who have not received instruction in technical agriculture is also considered.

Many of the agricultural colleges have already made provision for the recognition of high school agriculture for entrance credit. They also show a tendency so to organize the instruction of the first and second years of the regular college course as to permit the graduate of a high school vocational department of agriculture to elect advanced courses rather than to take the elementary courses which repeat much of the instruction which he has received in high school. There is a tendency to adapt the instruction in a given school to the agricultural needs of the community, and to limit the instruction to the well-established practices which are based upon experience as well as upon the results of college and experiment station work. Science teachers in the rural high schools are relating their instruction more definitely to the fields of agriculture and home economics.

The success of the training of teachers of agriculture is found to be largely dependent upon the meeting of the following conditions by the teacher-training institution: It should be in touch with the latest developments in the field of scientific and practical agriculture in so far as they relate directly to the agriculture of the State, and it should give the instruction in classes in technical agriculture from the standpoint of the use of the results of this instruction in the field of practical agriculture. Further, it should be in constant touch with the farmers of the State in order that there may be direct contact with the condition and development of agriculture in the State. The equipment of the institution should be the equal of any in the State in so far as instructors, laboratories, farm machinery and buildings, farm animals, etc., needed for instruction in subject matter of agriculture are concerned.

In 1918–19 courses for training vocational teachers of agriculture were given in 60 institutions reimbursed from Federal funds, as compared with 40 in the preceding year. During the war many of the States put into operation short intensive emergency courses through which men experienced in farming, trained in science, and with experience in teaching, were given instruction in technical agriculture. These classes have now been discontinued except in some cases where those who have already had one summer of instruction are being given an opportunity to complete a course already begun.

As regards the relationship between cooperative agricultural extension work and vocational agricultural instruction, general policies or principles are stated, upon which it is suggested that the State director of the agricultural extension service and the executive officer of the State board for vocational education should base a plan of cooperation for the State.

Marked progress during 1918–19 in the development of vocational home economics education is indicated both by an increase in the number of schools offering this subject, and the number of women and girls reached by such classes. Only 3 States in 1918–19 did not use Federal funds for instruction in this subject as compared with 10 in 1917–18. While in 1917–18 thirty-one

States made provision for the supervision of home economics instruction, in 1918–19 every State provided some supervision and also certification for its home economics teachers. There has been an improvement in the type of teaching and in the teacher-training courses offered. Plans and methods of supervision and types of vocational home economics schools developed are discussed.

The number of vocational home economics evening schools increased from 123 in 1917–18 to 127 in 1918–19, and the number of teachers from 688 to 758. The short unit course, varying in length from 8 to 36 lessons, has been found most effective in these evening schools. Only 6 States report part-time classes, a total of 27 such classes having been reimbursed from Federal funds in 1918–19.

The number of day schools, organized in most States as a part of the regular high school course, receiving Federal funds in 1918–19 was 309, with 604 teachers, as compared with 200 such schools and 398 teachers in 1917–18. Home project work has been developed in connection with the day schools. Five States have required home work to supplement the classroom instruction, and 2 States have outlined very satisfactory projects which are required of all students taking the vocational courses, and have provided for a system of supervision and reports on such subjects.

The home economics teacher is being employed for 12 months in several of the States. The effort to offer instruction under as nearly normal home conditions as the limitations of the school permit has led in some schools to the substitution of a school kitchen, in which the student works in quantities and uses utensils of average family size, for the individual unit equipment so commonly found in the average home economics laboratory. A number of schools have been equipped with housekeeping apartments, and in one State a practice cottage, fitted up as an average home, is required. Good results have been obtained from the insistence upon the use of the combination lecture and laboratory period. The demand in a number of schools for the production of a product that can be sold has raised the standard of work required of the students.

In 3 States the teacher training in home economics is conducted directly by the State Board for Vocational Education at established centers within the States. In 1918–19 forty-eight States used Federal funds to train teachers of home economics and 67 institutions were designated, with an enrollment of 3,098 and a teacher-training staff of 366. The length of the teacher-training course is 4 years in all States but four, and in two of the latter it is being developed into a 4-year course. More time is being devoted to methods and there has been a decided increase in the amount of practice teaching required. This now varies from 25 to 54 lessons, with a minimum requirement of a course of 3 credit hours or about 36 lessons, actually taught by each student. The improvement of teachers in service has been provided for in only a few States. Suggestions for further progress are made.

Volume 2 of the report deals with vocational rehabilitation. The statistics show that of a total enrollment of 5,650 disabled soldiers 626 were enrolled in agricultural courses June 30, 1919.

Department of rural and agricultural education (*Addresses and Proc. Natl. Ed. Assoc., 56 (1918), pp. 271–293*).—These proceedings include the following papers presented at the sessions of the department of rural and agricultural education of the National Education Association at its annual meeting in Pittsburgh, July 2–4, 1918: The Relationship Between Teacher-Training Departments Under the Provisions of the Smith-Hughes Act and State Supervisors of Agriculture for the State Boards for Vocational Education, by G. A. Works, and Sectional Conferences and Periods of Professional Improvement Work for Teachers of High School Agriculture, by R. W. Stimson, which have been previously noted (E. S. R., 40, p. 691); and Project Methods in Teacher-Training in Vocational Agriculture, by A. W. Nolan; Project Methods in Teacher-Training Courses, by W. S. Taylor; Home Project Work Too Small—Something Bigger Needed—A Substitute in Operation, by W. S. Welles; The Birth and Childhood of Vocational Education, with a Forecast of Its Development During Adolescence, by D. Snedden; The New Education in Agriculture Based on Sound Pedagogy, by W. R. Hart; and Effect of Rural Continuation School on Agricultural Efficiency, by R. W. Stimson.

First biennial report and recommendations of the [Mississippi] State Board for Vocational Education (*State Bd. Ed. Miss. Bul. 16* (*1919*), *pp. 21*).—According to this report, the passage of the Smith-Hughes law marks the beginning of systematic work in vocational education in Mississippi. In 1919, 36 schools with an enrollment of 978 boys in vocational agricultural courses were approved, as compared with 30 schools with an attendance of 713 boys in 1918. Practically twice as many boys began projects in 1919 as in 1918, and more than three times as many completed their projects. In 1919 the total amount of profit made by the boys from their projects was approximately $6,000, more than the total amount paid from Federal funds for agricultural instruction and State supervision for the year. Each vocational agricultural school is required to do some community or agricultural extension work for farmers, which included the setting out, pruning, and spraying of fruit trees, vaccination of hogs against cholera, and of cows and mules against blackleg and anthrax, the terracing of land, the dehorning of cattle, the testing of milk, etc.

Only $1,000 of Federal funds was available for each of the past 2 years for promotion of vocational home economics, hence only 3 county training schools for negroes and 1 school for white students received Federal aid for this subject. Three State colleges received Federal aid for the training of teachers of vocational subjects. Summaries of expenditures for vocational education are included, as well as brief statements of what other Southern States have done recently to promote vocational education.

Ohio State plan for vocational education (*Columbus: Ohio State Bd. Ed., 1920, pp. 50*).—This is an outline of the plan for the administration and supervision of vocational education in Ohio for 1919–20 under the Smith-Hughes Act.

Approval has been given to the College of Agriculture of the Ohio State University for teacher training in vocational agriculture, and to the Ohio State University, the University of Cincinnati, and Miami University for teacher training in vocational home economics. Of the Federal funds available for teacher training, it is proposed to expend approximately 25 per cent each on agricultural and home economics subjects, respectively.

The teacher-training curriculum in agriculture will be 4 years in length, comprising 136 unit hours, and will include at least 40 per cent of scientific agricultural work, 18 semester hours of professional work in education, which must include a course in special methods in vocational agriculture, and at least 4 semester hours of supervised practice teaching. It has been arranged to offer the latter in the agricultural department of 5 rural and village high schools located within easy distance of the Ohio State University.

The teacher-training course in home economics extends through 4 years and consists of from 30 to 40 per cent of vocational home economics subjects, 20 to 25 per cent of related technical subjects, 12 to 15 per cent of professional subjects, and 15 to 25 per cent of academic subjects. It has been arranged to use a typical high school in Columbus, 2 village high schools, a typical high school in Cincinnati, and the practice school on the campus of Miami University for observation and practice work.

The relation of nature study to boys' and girls' club work, T. Hadley (*Nature-Study Rev., 16 (1920), No. 2, pp. 54–61*).—The author believes that "the close relation of the school and the home will Americanize our foreign population and assist in relieving the present unrest more quickly than teaching English in night schools." It is suggested that nature study and boys' and girls' club work would produce that bond between teacher, school, pupil, and parents as no other subject taught. The ideals of nature study and the advantages that it will bring, if properly taught, to the community and the individual child are briefly reviewed.

The ideals of boys' and girls' club work are divided between two groups of instructors, viz, the far-seeing idealist group that is gradually learning the nature study point of view, and the group which is largely the product of the agricultural college, and who are largely interested in the economic value of the work. In the author's opinion, the ideals which are the background of nature study teaching and those of club work should be the same, as the same results can be obtained. The most advantageous kind of club work is a division of nature study.

Nature study teachers and club leaders should have a knowledge of the scientific subject matter necessary for such instruction, and should be given the nature study point of view. In each normal school there should be a required course in nature study, including the material and the method; also a required course in club work that will furnish the material of club projects and the broad point of view that will give the child all the benefits of club work. Further, no one should be permitted to teach nature study or be a club leader without the above training.

The principles of agriculture for high schools, J. H. Gehrs (*New York: The Macmillan Co., 1919, pp. X+[2]+594, pl. 1, figs. 203*).—This book consists of five sections dealing with the history, importance, geographical distribution, economic aspects, and factors influencing production, uses, etc., of (1) farm crops, (2) farm animals, (3) soils, (4) horticulture, and (5) farm management. Each chapter is followed by review questions, problems, and references to literature. This book and Gehrs and James's laboratory manual entitled One Hundred Exercises in Agriculture (E. S. R., 36, p. 596) are designed for a one-year course in high school agriculture.

Laboratory, field, and project guide in elementary agriculture, G. A. Schmidt (*New York: D. Appleton & Co., 1920, pp. XVII+226, pl. 1, figs. 75*).—This practical guide for teachers of elementary agriculture comprises exercises, projects, exhibits, and things to observe, arranged by months, relating to field crops, seeds and weeds, soils and soil fertility, farm animals, gardening, plant diseases and pests, and horticulture and propagation. It is intended to be used in connection with an elementary agricultural text and to cover two years' work, but is equally adaptable to courses of shorter length in which more time is given per week to the subject. An appendix contains tables showing the digestible nutrients in feeds, elements of plant food in crops and feeds, plant food in commercial fertilizing materials, a gardener's planting table, score cards, etc.

An outline for seasonal presentation of farm crops and horticulture, E. F. Johnson (*Ohio State Bd. Ed. Vocat. Agr. Bul. 2 (1919), pp. 44, figs. 5*).—In this seasonal presentation outline of farm crops and horticulture the author suggests subject matter, literature, and references; subjects for class reports; illustrative and laboratory materials; field trip exercises; and laboratory work. Suggestions on preparing laboratory and illustrative material are added.

[Instruction in gardening] (*Nature-Study Rev., 16 (1920), No. 3, pp. 89-106, 113-122, 124-129, figs. 9*).—This number is devoted largely to gardening work and includes the following articles:

Efficiency Aids to Garden Work, by E. E. Shaw (pp. 89-94).—This is a discussion, by the curator of elementary instruction, of aids given in her garden work with children at the Brooklyn Botanic Gardens, including the preliminary work in familiarizing pupils with the materials to be used and the method employed in the use of such materials, begun six weeks before the garden is actually planted.

Gardening as a Part of City Education, by J. L. Randall (pp. 95-97).—The author calls attention to the need of subjects allied to biology for the education of the city child and for the introduction of which, as school and continuation school activities, gardening is paving the way.

A Garden Health Drive, by A. Walker (pp. 98-101).—This is a revision of a play dealing with the classes of garden pests and methods of combating them, which was first published in the *National Service Bulletin* of March 15, 1919.

Some Enemies of the Garden, by G. W. Herrick (pp. 113-122).—This article describes the enemies of the cabbage family, cucumbers and squashes, the Irish potato, the tomato, and radishes, and their habits and methods of control.

Reports from Garden Supervisors (pp. 124-129).—Brief reports are given on the garden work in Waltham, Mass., Louisville, Ky., Philadelphia, Pa., Washington, D. C., Grand Rapids, Mich., and Richmond, Va.

The remaining articles deal with Costumes and Scenery for the Garden Health Drive, by D. Kalb (pp. 101-103); Bits of Interesting School Garden History (p. 104); and Are Exhibits and Prizes of Value? by A. N. Roberts (pp. 105, 106).

Syllabus of The Horace Plunkett Foundation lectures on rural sociology, A. W. Ashby (*Oxford, Eng.: Inst. Research Agr. Econ., [1919], pp. 10*).—This is a syllabus of six lectures, given at the University of Oxford in 1919, dealing with the economic foundations of rural society, rural population and its physical conditions, mental condition of the rural population, voluntary associations, constitutional aspects of village society, and social relations between town and country. It indicates the subjects dealt with rather than the conclusions reached. The course is intended to provide an introduction to the study of rural society and to general social conditions in agricultural districts. Aspects of the history of rural life in England and Wales during the nineteenth century are included in order to provide a historical background and avoid generalization without direct reference to concrete facts. A few selected readings and a series of books of reference on the subject dealt with are appended to the summary of each lecture.

MISCELLANEOUS.

Report of West Central Experiment Station, Morris, 1918 (*Minnesota Sta., Rpt. Morris Substa., 1918, pp. 54, figs. 14*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of the Dickinson substation for the years 1914 to 1918, inclusive (*North Dakota Sta. Bul. 131 (1919), pp. 83, figs. 20*).—This report consists of the seventh to eleventh annual reports of this substation. The experimental work recorded is for the most part abstracted elsewhere in this issue.

NOTES.

Delaware College and Station.—George L. Schuster, assistant agronomist of the West Virginia Station, has been appointed professor of agronomy and agronomist, beginning April 1. Louis R. Detjen, assistant horticulturist of the North Carolina Station, has been appointed associate horticulturist in the college and station.

Florida Station.—Dr. R. W. Ruprecht, formerly of the Massachusetts Station, has been appointed plant physiologist beginning May 1.

Idaho University.—Claude Wakeland, deputy State entomologist of Colorado and in charge of alfalfa weevil investigations from 1917 to 1919, has accepted a position as State extension entomologist with headquarters at Boise.

Kansas College.—The second annual students' grain judging contest was held at the college April 10 with 116 students competing. The principal prize was offered by the Kansas Crop Improvement Association.

Kentucky University and Station.—The resignations are noted of Geoffrey Morgan, assistant director of extension, on March 31; Ralph Morgan as district agent in the extension division on April 30; D. D. Slade as extension poultryman on March 15; and O. F. Floyd, extension market specialist, on March 31. Charles A. Mahan has been appointed State agent in the extension division and A. C. Burnette in charge of negro extension work.

Minnesota University.—The honorary degree of Doctor of Agriculture was conferred on Dean R. W. Thatcher April 14 by the University of Nebraska. J. S. Montgomery, formerly connected with the university, has returned as extension specialist in beef cattle, hogs, and horses, beginning May 1.

Nevada Station.—Some interesting results have recently been obtained in a preliminary test of souring sunflower silage by means of lactic acid bacteria. Dr. Lewis H. Wright, assistant veterinarian, has resigned.

New Mexico Station.—Some very encouraging results of pasturing range cows on the native shadscale (*Atriplex canescens*) are reported. Ten range cows, four of them with calves, which were turned out on this native brush about the first of the year have kept in unexpectedly good condition and without loss of weight. This plant gives promise of being an excellent emergency feed, especially during periods of drought and very cold winters. Work on methods for its propagation is now being planned.

Results from the new project for the improvement of the native New Mexico goat by crossing with the Toggenburg breed for milk production are also encouraging. One of the ten does bought out of a common herd from a native goat raiser is now giving 5 lbs. of milk a day.

Ohio State University.—E. F. Johnson, assistant professor of agricultural education, resigned April 15 to engage in farming.

Oklahoma College and Station.—M. A. Beeson, head of the department of agronomy, has resigned to take effect July 1 to engage in commercial work. Frank B. Cross, assistant in horticulture, resigned May 1 to become a county agent in New Jersey.

Pennsylvania College and Station.—The resignations are noted of W. H. Darst as associate professor of farm crops, P. E. Dougherty as assistant professor of animal husbandry extension, C. M. Cummings as instructor in dairy husbandry, and J. S. Owens as instructor in agricultural extension. Recent appointments include the following: Ward C. Pelton, specialist in vegetable gardening at the Connecticut State Station, as professor of vegetable gardening, beginning June 1; Ross M. Gridley, field agent in animal husbandry in the Georgia College, as assistant professor of animal husbandry extension; Henry W. Thurston, jr., formerly associate plant physiologist at the Nebraska Station, as assistant professor of plant pathology; C. R. Mason, instructor in horticulture at Purdue University, as instructor in vegetable gardening, beginning June 1; Allen L. Baker as instructor in agricultural extension; and Frank G. Bamer, B. B. Mason, Paul S. Williams, and Lawrence W. Smith as assistants, respectively, in agronomy, rural organization extension, dairy husbandry extension, and forestry, beginning June 1.

Virginia Truck Station.—John T. Griffin, a member of the governing board since the organization of the station in 1907 and its president since 1913, died April 14. He was largely responsible for the establishment of the station and also for the organization of the Southern Produce Company, which now handles as a cooperative exchange about 75 per cent of the truck farm and market garden products of southeastern Virginia.

Agricultural Education and Research in Latin America.—The Government of Argentina has recently offered additional scholarships in the agricultural schools of Casilda, Tucuman, Cordoba, and Mendoza to young men of Peru desiring to follow up their studies in Argentina. The municipal council of Buenos Aires, on December 22, 1919, passed an ordinance providing for the establishment of a practical school of aviculture in connection with the zoological garden. During the apprentice period pupils will be required to give their services to the school gratuitously. On the completion of the course a diploma as practical aviculturist will be given.

In the Colombian Ministry of Agriculture a department of cattle and meat inspection has been established to study contagious cattle diseases and their remedies, and to inspect cattle and meat products intended for export to countries which demand certificates of inspection. A law of November 5, 1919, grants a subsidy of about $10,000 for the establishment of a course in agriculture and industries in the University of Nariño.

The Department of Agriculture of Cuba has decided to establish a bureau of commercial information in European and American countries for the purpose of establishing cordial commercial relations between Cuba and the other countries. The first bureau will be established in France.

Organization of Research Department by the Olympia Agricultural Company, Ltd., of Great Britain.—The Olympia Agricultural Company, Ltd., is a British syndicate which has purchased agricultural estates aggregating 20,000 acres in the counties of Yorkshire, Northamptonshire, Cambridgeshire, Suffolk, Warwickshire, and Wiltshire. A research department has recently been organized under the direction of Dr. Charles Crowther, professor of agricultural chemistry in the University of Leeds and director of the institute for research in animal nutrition in that university. This department will exercise advisory functions in connection with the large scale farming operations of the company, and for some time its activities will consist mainly of experiments essential to the establishment of a sound basis for this advisory work, but it is announced that its primary object will be to conduct research in various branches of agricultural science and practice for the general welfare of British agriculture.

The headquarters of the department have been located on the company's estate of about 2,700 acres at Offchurch, near Leamington, in Warwickshire, where the ancient mansion of Offchurch Bury is being adapted to provide the necessary laboratories and other improvements which are now approaching completion. From this center, experimental work with crops and live stock on all the company's estates will be carried out under the general supervision of Capt. F. H. Billington, formerly of the staff of the Irish Department of Agriculture and Technical Instruction.

Under the plans announced, Dr. Crowther will continue and extend his present studies in agricultural chemistry and animal nutrition in addition to his administrative duties. Plant breeding research is expected to be a further prominent feature of the department's activities, under the direction of Capt. Hunter, lately in charge of the plant breeding work conducted in Ireland by the Department of Agriculture and Technical Instruction. Provision has also been made for research on soil problems and plant nutrition, under the direction of Capt. C. T. Gimingham, formerly chemist of the agricultural research institute of the University of Bristol.

It is stated that liberal financial provision for the research department has been made by the company. *Nature* regards the inauguration of this work as a very important event, concluding its account of the enterprise as follows: "The enhanced appreciation of the importance of research to British industries is one of the most significant effects of the war, and it is gratifying to find that British agriculture, despite its traditional conservatism and suspicion of academic 'theory,' is not to lag behind other industries, and a good omen that it should contain in its ranks men so alive to the value of research as to provide for it within the industry without the stimulus of subvention from the public purse."

Agricultural Instruction and Experiments at the University of Nanking.—The latest annual report of the College of Agriculture and Forestry of the University of Nanking, China, indicates that noteworthy progress has been made at this institution in the development and extension of its agricultural work. One of the most striking events was the organization, late in 1918, of an agricultural experiment station. This action followed a recommendation by Prof. C. W. Woodworth of the California University and Station, who was then temporarily serving at the college as special investigator and lecturer on entomology. Subsequently, several tracts of land, aggregating about 21 acres, were purchased at a cost of $9,000. About 5 acres have already been planted to mulberries for sericultural work, and the remainder is under general cultivation. The college also has the use of about 36 acres of vacant university land, though the small size and scattered nature of the various holdings constitute a serious handicap to experimental work. It is estimated that eventually at least 160 acres of adjacent land will be needed for the college farm and station.

Much of the principal work so far under way has dealt with sericulture. About $5,000 has been provided for this by the International Committee for the Improvement of Sericulture in China. The chief undertaking of the committee is to produce certified silk worm eggs by the Pasteur process and distribute them to farmers, studies at the college indicating an average incidence of disease of 66 per cent for uncertified stock. This work was temporarily interrupted by fire, which destroyed the entire product for the year. The college is also grafting 100,000 mulberry trees for sale at cost in 1921 and 150,000 for 1922, and is carrying on experiments in the production of mulberry cuttings and studies in pruning, fertilization, culture, etc. Tests are being made on the utilization of the autumn crop of mulberry leaves, as well as breeding and selection work with silk worms. A three-month course in sericulture has been instituted, and extension work through lectures and demonstrations is contemplated.

Cotton experiments have already shown that certain foreign varieties can be successfully grown in China, though careful tests are necessary to determine the adaptability of varieties to diverse conditions. A cooperative test was organized in 1918 in eight provinces with pure seed of the standard test sets of the U. S. Department of Agriculture. The cotton improvement work is being supported by two Chinese cotton mill owners' associations and the Shanghai Anti-Adulteration Association.

Improvement of native corn by pedigree selection has been carried on for four years, and seed distribution to farmers is to be begun this spring. There has also been selection work with about 75 strains of lowland rice, 100 native and foreign strains of wheat, and about 100 varieties of fruits.

There is much interest in forestry, and about 7 acres of land are devoted to forest nurseries. A colonization project on Purple Mountain has largely developed into a reforestation demonstration.

The student enrollment has numbered about 100, of whom 42 were regular students in agriculture, 30 in forestry, and 26 in the short course in sericulture. The demand for trained graduates has exceeded the supply, notably for assistants for agricultural missionary work. There has been a marked increase in interest on the part of missionary organizations and also by a number of influential government officials.

Shakespearean Garden at Stratford-on-Avon.—*Nature* announces that the trustees and guardians of Shakespeare's birthplace at Stratford-on-Avon are laying out the "Great Garden" as an Elizabethan garden. Old-fashioned flowers, such as are mentioned in his writings or are otherwise known to have been then in cultivation will be utilized, thus restoring the garden so far as possible to its original aspect.

Soldier Settlement in Italy.—What is known as the Opera Nazionale per i Combattenti (National Assistance of Soldiers and Sailors) was established toward the close of 1918, primarily to take charge of certain annuities granted to service men on engaging in farming or certain other productive occupations. This organization is empowered to acquire lands from both public and private sources and to improve these properties for eventual sale or lease to ex-service men. It also promotes the formation of farming colonies, cooperative agricultural associations and societies, and affords certain credit facilities.

Miscellaneous.—The legislature of the State of Bahia, Brazil, has recently authorized the department of agriculture to institute a series of agricultural experiment stations throughout the State. A unique feature of the legislation is that the service authorized is to be made self-supporting by the collection of a one per cent export duty on all agricultural products.

Dr. John W. Macfarlane, professor of botany and director of the Botanical Laboratory and Botanic Garden of the University of Pennsylvania, retires June 30 after twenty-eight years' service.

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EXPERIMENT STATION RECORD.

VOL. 42. ABSTRACT NUMBER. No. 9.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Proso millet investigations.—Analysis of the oil.—A characteristic alcohol, B. A. DUNBAR and E. R. BINNEWIES (*Jour. Amer. Chem. Soc., 42 (1920), No. 3, pp. 658–666*).—In connection with an investigation of the grain of the proso millet, with a view to its employment as a commercial food source, the authors have analyzed the oil which can be obtained by extraction from the grains to the extent of about 5 per cent.

The oil was found to be a semidrying oil, having a specific gravity of 0.9228 at 22.5° C. and a refractive index (Abbé) of 1.4745. The chemical constants were as follows: Saponification number 181.5, iodin number (Hübl) 92.3, free fatty acids calculated as oleic 11.9 per cent, acetyl value 39.23, Reichert-Meissl number 2.5, and unsaponifiable matter 2.52 per cent. The volatile acids constituted 0.36 per cent calculated as formic acid, and the insoluble fatty acids 89.8 per cent of the oil. Of the latter 85.3 per cent were unsaturated and 14.7 per cent saturated. The saturated acids appeared to be composed of a comparatively large amount of palmitic acid with smaller quantities of carnaubic and daturic acids. The unsaturated acids were composed largely of oleic and linolic acids and an isoform of linolic acid.

It was found that the oil on standing for several hours deposited a mass of white crystals, which on purification yielded six-sided crystals resembling those of phytosterol, but differing from the latter in certain respects, particularly the melting point, which was 279°. An examination of this substance has led to the conclusion that it is a ketone-alcohol of a tentative molecular formula of $C_{24}H_{38}O_2$. To this compound, pending its further examination, the name of prosol has been given.

[Composition of the velvet bean], E. R. MILLER (*Alabama Col. Sta. Rpt. 1919, p. 34*).—Data are reported on the composition of the velvet bean (Early Speckled variety) as follows: Ash 2.8 to 2.9 per cent, calcium 0.13 to 0.15, magnesium 0.14 to 0.16, phosphorus 0.4, sulphur 0.31, chlorin 0.021, ether extract 6.5, protein 20, carbohydrate (principally starch) 30, and alcoholic extract 12 to 13 per cent.

The ash content of the stems and leaves of the plants collected when the fruit was mature was 2.96 and 11.9 per cent, respectively, and the corresponding figures for the plant in full bloom were 4.37 and 5.85 per cent. The stems of plants in bloom contained 0.71 per cent calcium and 0.319 per cent magnesium, and the leaves 1.433 per cent calcium, 0.214 per cent magnesium, and 0.187 per cent phosphorus.

The results obtained from other varieties of velvet beans did not differ greatly from those of the Early Speckled variety.

Catalysis in theory and practice, E. K. Rideal and H. S. Taylor (*London: Macmillan & Co., Ltd., 1919, pp. XV+496, pls. 2, figs. 35; rev. in Nature [London], 104 (1920), No. 2619, pp. 463, 464*).—This volume treats of the fundamental principles involved in catalysis and their application in modern chemical processes. The subject matter is considered under the following headings: Early history, theoretical introduction, the measurement of reaction velocity in catalytic processes, oxidation processes, hydrogen and hydrogenation, dehydrogenation, the fixation of nitrogen, hydration and hydrolysis, dehydration, applications of catalysis to organic chemistry, ferments and enzyms, catalysis in electrochemistry, catalysis by radiant energy, and catalysis in analytical chemistry.

An effective connecting bulb, C. M. Clark (*Jour. Indus. and Engin. Chem., 12 (1920), No. 4, p. 366, fig. 1*).—The essential feature of the bulb described is a baffle plate in the form of a deep watch glass, which is fastened to the exit tube and reaches to within about 5 mm. of the side of the bulb. Any spray entering the bulb from the distilling flask strikes against the concave side of the plate and is prevented from reaching the small holes in the exit tube through which the vapor passes to the condenser. A small hole near the lower extremity of the inlet tube and a slight narrowing of the end of the tube are other features which, although not considered essential, assist in holding back the spray. A diagram is given of the bulb.

The use of cupferron in quantitative analysis, G. E. F. Lundell and H. B. Knowles (*Jour. Indus. and Engin. Chem., 12 (1920), No. 4, pp. 344–350*).—This paper consists chiefly of a review of the literature on the use of cupferron (C_6H_5 N. NO. ONH_4) as a quantitative precipitant, together with the results obtained at the U. S. Bureau of Standards in an attempt to adopt the cupferron method to the determination of zirconium.

The conclusion is drawn that while cupferron has been successfully used for the quantitative determination of copper, iron, titanium, zirconium, thorium, and vanadium, so many elements interfere with the determinations that the method should not be employed unless the qualitative composition of the substance is known, or a qualitative examination of the ignited and weighed cupferron precipitate is made. It is thought that cupferron can be used to good advantage in certain separations, such as iron from manganese and iron and titanium from aluminum and manganese.

Boric acid modification of the Kjeldahl method for crop and soil analysis, F. M. Scales and A. P. Harrison (*Jour. Indus. and Engin. Chem., 12 (1920), No. 4, pp. 350–352*).—An investigation of the possibility of using boric acid in place of sulphuric acid for the absorption of ammonia in the Kjeldahl nitrogen method as suggested by Winkler (E. S. R., 31, p. 108) is reported from the Bureau of Plant Industry, U. S. Department of Agriculture.

The boric acid solution was prepared by dissolving the pure crystallized acid in distilled water at room temperature in the proportion of 4 gm. of the acid to 100 cc. of the water. It was found that 50 cc. of this solution was sufficient to absorb 95 mg. of nitrogen as ammonia. Methyl orange, congo red, and bromthymol blue were used as indicators in titrating the excess of boric acid with standard H_2SO_4. With the first two the end-point was determined by matching against a standard. With bromphenol, the end-point was observed by arranging an electric bulb a few inches from the reflecting surface of the burette stand in such a way that the flask was between the bulb and reflecting surface, the end-point being the disappearance of the purple color. This indicator proved more satisfactory than the other two.

Comparative tests with sulphuric and boric acids as absorbing solutions for the ammonia set free from ammonium sulphate and from various crops and soils in the usual Kjeldahl procedure are reported, which indicate that the boric acid method gives as accurate results as does the sulphuric acid. It is recommended as of special value in laboratories where many nitrogen determinations are made, as it requires only one standard solution and is time saving in that the boric acid solution can be measured without special accuracy. If the acid solution is made of such strength that 1 cc. equals 1 mg. of nitrogen or some whole number multiple, further time may be saved on calculations.

Colorimetric determination of glycogen, R. THIEULIN (*Jour. Pharm. et Chim., 7. ser., 21 (1920), No. 3, pp. 91–93*).—For the quantitative determination of glycogen in small fragments of liver, the author recommends a colorimetric procedure depending upon the reaction of glycogen with iodin. A series of standards is made up containing known amounts of glycogen in solution and a fixed amount of iodin, and these are matched against a solution of the sample prepared by treating the liver with concentrated KOH, precipitating the glycogen with an equal volume of alcohol, centrifuging, dissolving the precipitate in distilled water, and neutralizing it with acetic acid.

Invertase activity of mold spores as affected by concentration and amount of inoculum, N. KOPELOFF and S. BYALL (*Jour. Agr. Research* [*U. S.*], *18 (1920), No. 10, pp. 537–542*).—This contribution from the Louisiana Sugar Experiment Station consists of a study of the limits of concentration of cane sugar solutions at which the invertase of mold spores is active, together with a study of the influence of the numbers of mold spores upon their invertase activity in sugar solutions at the saturation point. The spore suspensions were prepared according to the methods previously described (E. S. R., 42, p. 336).

The invertase activity of the spores of blue aspergillus (*Aspergillus sydowi*), *A. niger*, and *Penicillium expansum* was exhibited at concentrations of sugar varying from 10 to 70 per cent, the maximum activity occurring between 50 and 60 per cent concentration. The spores of the blue aspergillus appeared to be relatively more active in inverting power than the other two molds.

Invertase activity in a saturated sugar solution was found to increase with the number of spores. The least number of spores required to produce inversion in such a solution was about 5,000 for *A. sydowi*, and between 50,000 and 110,000 for the other two species.

These results are considered suggestive in their bearing upon the practical problem of sugar deterioration. "A certain correlation to be emphasized is that the blue aspergillus, which was found to have the greatest capacity for deteriorating sugar (besides occurring with greatest frequency), has spores which appear to exhibit the most intense invertase activity in saturated sugar solutions. Since we have pointed out that sugar inoculated with spores of this mold deteriorated without the development of mycelia, the conclusion would appear to be substantiated that mold spores alone, if present in sufficient number, are capable of deteriorating sugar."

The effect of concentration on the deteriorative activity of mold spores in sugar, N. and L. KOPELOFF and B. BYALL (*Jour. Indus. and Engin. Chem., 12 (1920), No. 3, pp. 256, 257*).—The results of the above study are corroborated by an investigation of the deteriorative activity of mold spores in sugars of known composition. A series of sugars with films of known composition were prepared by coating large crystals of sterilized sugar with sterilized black strap molasses and 60° Brix sugar sirup in definite proportions and purging in the centrifuge. The sugars were aseptically inoculated with mold spores by adding 15 gm. of sugar, containing approximately 1,000 spores per gram, to 135 gm. of sugar in Erlenmeyer flasks, which were then tightly corked and paraffined. The corresponding molasses was inoculated with a single scoopful of mold. All of the flasks were incubated at from 28 to 30° C. The results obtained are tabulated and summarized as follows:

"A decrease in concentration of molasses inoculated with molds is responsible for a progressive increase in reducing sugars and a decrease in sucrose Clerget when incubated at 30° for 4 months. A decrease in the concentration of films in inoculated laboratory-made sugars having films of unknown concentration, and moisture ratios of 0.08 to 0.2 caused an increase in reducing sugars (and a decrease in sucrose Clerget) which gave evidence of active deterioration. These sugars were incubated at 30° for 1 month, and similar results followed a like incubation of 4 months. *Aspergillus sydowi*, followed by *A. niger* and *Penicillium expansum* in the order named, effected the greatest deterioration in both molasses and sugar."

Food preserves, L. Lavoine (*Les Conserves Alimentaires. Paris: Libr. Hachette & Co., 1917, 6. ed., pp. VIII+156, figs. 99*).—This is the sixth edition of a manual of food preserving designed for both the town and country housewife, and also the farmer or producer. It contains brief general directions for the preservation of foods by heat sterilization, refrigeration, desiccation, antiseptics, and surface coating, and special directions for the treatment of specific materials under each general process. The subject matter is supplemented by illustrations and diagrams.

Process of treating dried fruit, S. Katzprowsky (*U. S. Patent. No. 1,253,045, January 8, 1919*).—This patent (No. 1,253,045) covers a process of treating dried fruits with a dextrin-containing solution, preferably commercial glucose, which prevents sugaring of the fruit and at the same time improves the appearance of the dried product.

The process, as applied to raisins, consists of heating nearly to the boiling point a commercial glucose solution of from 36 to 46° Balling and immersing the raisins in the solution for from 10 to 20 seconds, after which the raisins are heated to 200° F. for a short time to evaporate the water of solution. When dried the glucose forms a glossy tough coat which prevents the cracking of the raisins and the consequent sugaring of the pulp. The amount of glucose which is required to thoroughly seal the fruit adds from 2 to 3.5 per cent to the weight of the fruit.

[Fruit drying] (*California Sta. Rpt. 1919, pp. 31, 33, 34*).—The summary of research work of the station along this line during the past three years includes a brief report of a survey of the State covering drying practices, conducted by W. L. Sweet.

About 8 lbs. of sulphur per green ton of fruit is used in drying fruit. The average exposure to the sulphur dioxid fumes varies from 4 hours to over night, after which the fruit is exposed to the sun for 2 or 3 days and then stacked for the same length of time. Peaches are dried for 3.5 days in the sun and about 6 days in the shade. With pears, from 15 to 20 lbs. of sulphur per green ton is used with an average exposure to the sulphur dioxid fumes of from 12 to 48 hours, exposure to the sun for 1 or 2 days, and stacking for from 10 to 28 days. Prunes are first dipped in a solution of 4.6 lbs. of lye to 100 gal. of water just below the boiling temperature, and are then sun-dried on trays for about 5 days and stacked for the same length of time. Data are given on the drying rate of different varieties of peaches and prunes.

In experiments on drying fruits without sulphurous acid, W. V. Cruess has found that the color of most fruits is satisfactorily retained if the fruits are cooked in a 40 per cent glucose solution for from 3 to 30 minutes (depending upon the fruit) before drying. A study is being made by E. L. Overholser and Cruess of the chemical processes involved in the sulphuring of fruits and their effect upon the fruit tissues, and upon the palatability of the product. The possibility of salvaging rain-damaged prunes by sulphuring has been previously reported by Cruess (E. S. R., 41, p. 117).

Fruit-drying investigatons during the summer of 1918 with several varieties of peaches indicate that some of the white-fleshed varieties may prove as useful for drying purposes as the yellow varieties now handled. A comparison of the dried products of fully ripe with partially ripe peaches showed an 11 per cent gain in weight of the ripe over the partially ripe fruit.

The process of treating dried fruits with a dextrin solution, developed and patented by S. Katzprowsky as noted above, has been found to consistently prevent sugaring in experimental tests.

[Grape juice and sirup] (*California Sta. Rpt. 1919, pp. 40, 41*).—The preliminary report by F. T. Bioletti and W. V. Cruess on grape sirup, previously noted (E. S. R., 40, p. 414), is supplemented by the statement that "a sirup of fresh grape flavor and of either deep red or white color has been made by a combination of the freezing and the vacuum evaporation processes. This sirup is excellent for table use, water ices, ice cream, and for a beverage when diluted with carbonated water. It may be made from wine grapes or sound second crop and cull table or raisin grapes."

It is also stated that satisfactory grape juices of a red color and considerable acidity or tartness can be made by combining slightly under-ripe red wine grapes with ripe Muscat or highly flavored wine grapes, such as Semillon or Riesling.

[Olive investigations] (*California Sta. Rpt. 1919, pp. 41, 42*).—A study by W. V. Cruess and J. R. Zion of the control of color in ripe olives is reported. The darkest and best color was obtained when the lye used did not exceed 3 per cent or fall below 1 per cent, and when the first treatment barely penetrated the skin. Exposure after the second lye treatment did not increase the color. Slight alkalinity of the brine in the cans (not over 0.01 per cent) increased the color, while acidity bleached it. The use of enameled cans was found to be favorable to the stability of the color, while plain tin injured the color and clouded the brine. A study by Cruess of the functions of lye during the various stages of olive processing has been previously noted from another source (E. S. R., 42, p. 113), as has also the description of a new process of olive pickling by the use of heated, aerated, and circulating liquids (E. S. R., 38, p. 617).

A process by which the disagreeable odors and flavors of inferior olive oil can be removed has been developed by Cruess and C. C. Scallone. The process consists of treating the oil at from 185 to 190° F. with about 0.1 per cent of soda ash, from 2 to 5 per cent of fine bone-black, and a stream of carbon dioxid, after which the oil is cooled and filtered.

In cooperation with A. W. Christie it has been found that olive pomace contains from 6 to 14 per cent of oil, which may be recovered by means of solvents such as gasoline, and used in soap making.

METEOROLOGY.

Determination of normal temperatures by means of the equation of the seasonal temperature variation and a modified thermograph record, F. L. West, N. E. Edlefsen, and S. Ewing (*Jour. Agr. Research [U. S.], 18 (1920), No. 10. pp. 499–510, figs. 6*).—This paper, which is a contribution from the Utah

Experiment Station, "gives an approximate solution of the problem of the determination of the normal temperature at a certain place at an assigned hour of the day on a particular day of the year.

"An equation that shows the seasonal change in temperature is presented and gives the mean daily temperature in terms of the time of year. Another equation gives the percentage of the mean temperature that the temperature of a particular hour of the day is in terms of the time of day. The product of the results of the solution of the equations gives the temperature sought. The equation is of general application, inasmuch as the first term is the mean annual temperature and the value for the location considered is to be inserted in the equation before using it.

"An arithmetical solution is also presented. The hourly temperatures, expressed as percentages of the mean daily temperatures, are given. The mean monthly temperature for each of the 12 months must be known for the location considered. The mean daily temperature changes approximately one-third of 1° F. a day, except from December 15 to January 15 and from July 15 to August 15, when the mean temperature for any day is approximately equal to the mean temperature for the month. With this information, the mean daily temperature is readily calculated, and by multiplying this value by the percentage found in the table for the particular hour considered, the desired probable temperature is obtained.

"In the arid West the mean error of the method of determining the normal temperature is very small, but the mean error in predicting the actual temperature is 7°, with 60 per cent of the errors less than this amount. These errors are due largely to the abnormal temperatures produced by rain and snowstorms."

Alfalfa seed growing and the weather, with particular reference to conditions in Utah, J. C. Alter (*Utah Sta. Bul. 171 (1920), pp. 3–31, figs. 9*).—This bulletin is based upon the results of a study of climatic conditions in the older alfalfa growing regions, e. g., Persia and Turkestan, and in the humid as well as the drier portions of the United States where alfalfa seed production has been attempted, especially in Utah.

It is shown that "seed crops are matured occasionally in nearly all parts of the United States, but the certainty of the crop and the security of the industry are greatest in the Plateau States, where the yields per acre are much the greatest. A crop is grown in the Central States in those seasons when the corn crop fails because of drought; the yields here run from 2 to 3 bu. per acre; but over the more arid West, crops of from 4 to 6 bu. are grown about four years out of five. The failures of the western crops are due principally to such causes as temporary shortage of irrigation water; excessive wet from inopportune rains, perhaps on a recent watering; desiccating winds at blossom time; untimely spring or autumn frosts; grasshoppers; and weevils."

In humid regions the seed crop "is strictly limited to the thinnest stands on the driest lands, and even there the seed sets in fair quantities only in the occasional extremely droughty years. . . . Even in the more favorable arid regions the seed crop is very exacting in its current meteorological requirements, from the first spring growth, through early summer maturity, to late summer or autumn harvests. . . . The seed crop is a more or less direct result of the meteorological conditions which produce the preceding crop of hay."

The main meteorological requirements appear to be "a rapid and early rise of springtime temperatures, without setbacks or lack of moisture, to get the first or hay crop off the field, also to place the right amount of moisture in the soil for producing a vigorous and thrifty root system, and get the seed crop started off in time to mature before autumn frosts. The summer must be quite dry to produce seed rather than stem and leaf growth, and yet moisture must be ample and timely for filling the seed. Heavy rains must not wash away the pollen. If dependent on natural precipitation, 2 or 3 in. a month from March until June in Utah, with from ½ to 1 in. a month in light showers from July to September, are desirable. The summer must not be too warm, particularly at blossom time, as the wilting and blighting of the bloom occurs readily when moisture is deficient and winds and temperature excessive. The optimum mean temperatures in western Utah are about as follows: March, when the hay crop begins growth, 40° F.; April, 48° for rapid development; May, 56°; and June, 65°. . . .

"The seed crops should have a July mean temperature of about 70° and August 75° for the blooming and seed setting periods. If the average September temperature is 60° or lower it appears that there is a strong probability of frost before harvesting is completed. . . . Seed yields greater than average in Utah seem to require an abnormally warm spring, the temperatures from 3 to 5° above normal, at least during March and April. Such a spring should be followed by a summer from 2 to 4° cooler than usual to give a slow and gradual growth and a consequent better and more extensive setting of seed. Mean monthly maximum temperatures above 90° in the blooming months are unfavorable, and short periods with temperatures above 100° when moisture is deficient, cause light yields. The seasons are somewhat longer and freer from frosts on the gently sloping lands near the mountains than far out on the flat lands, the season being lengthened from two to three weeks." "An excess of cold cloudy weather at blossom time is unfavorable, an optimum being about 30 to 35 per cent cloudiness. . . .

"The average maturing season for the principal seed regions of Utah is about 80 days, the first cutting coming about June 15 to 20. Forty days are then required to reach the early blossom stage, or cutting time for hay, being July 25 to 30. Forty additional days necessary for maturing the seed bring the harvest about September 4 to 9, one or two weeks before the average date of first killing frost in autumn. The extent of frost injury is greatly lessened by cutting the partly ripened seed just prior to a frost, as the seed is much better protected in the bunch or windrow. A light frost is warded off by irrigating the land just prior to the frost. Weevil depredations are greater in cold, wet spring seasons, and dry, hot weather in summer favors weevil extermination by dust mulching. After a late spring heavy pasturing and spraying are recommended for weevil extermination."

"There is usually little winterkilling of ordinary alfalfa in any of the better seed growing States, and the plant is accredited with the ability to withstand great extremes of heat in summer and cold in winter without especial injury to its root system, though the Grimm, Baltic, and sand lucern varieties and other hardy strains do best in Montana and adjacent regions, while the Peruvian variety does best in the warmer regions of California and Arizona. . . . The Baltic, Grimm, sand lucern, and some others [do best] where the general average winter temperatures are from 20 to 25° and summer temperatures 70 to 75°, but the Peruvian variety does best where the winter mean temperature is above freezing and the summer means 85 to 95°."

A considerable bibliography of the subject is appended.

A further report on Montana climate, E. BURKE and R. M. PINCKNEY (*Montana Sta. Circ. 87 (1919), pp. 15, figs. 4*).—The available data on precipitation and temperature as recorded at 30 selected places in the State are summarized and discussed, with the particular purpose of giving a comprehensive idea of precipitation conditions in the past and their probable recurrence in the future.

The rainfall data are classified with reference to three natural rainfall districts, namely, eastern mountain, western mountain, and plains districts. "The mountain district west of the main range shows an annual rainfall of 15.75 in., with extremes ranging from 11.65 in. to 22.13 in. The average rainfall for the growing season of April, May, June, and July is 6.23 in., or but 40 per cent of the annual. In the northwestern corner of the State the seasonal rainfall is even a smaller proportion. Only 26 per cent of the rain of the year comes in May and June. This district must make a special effort to conserve the fall and winter precipitation. In the mountain district east of the main range the average yearly rainfall is 16.22 in., varying from 11.09 in. to 23.53 in. The rainfall for April, May, June, and July is 53 per cent of the annual, and that for May and June is 35 per cent of the annual.

"The plains area of the State is drier than either of the mountain areas. The average yearly precipitation is 13.63 in., with a range from 12.06 in. to 15.51 in. The rainfall for the growing season is about 55 per cent of the annual, and that for May and June is 37 per cent of the annual. Contrasting the districts east of the Continental Divide, it is noted that while the plains district has over 2.5 in. less annual rainfall it has only 1.2 in. less during the growing season and about 0.7 in. less in May and June.

"Considering next the dry year of 1904 and also those of 1917, 1918, and 1919, we find not alone a low annual rainfall, particularly east of the Continental Divide, but a rainfall during the growing season that shows a lower percentage of the total than is normal, while May and June show a very low percentage of the total precipitation. This is particularly true of this year, 1919. We had thus two adverse conditions during the past three seasons; first, a low annual rainfall; and, second, a lower percentage of that which did come fell in the growing season." The rainfall records at the majority of the points of observation agree with the general average, although there are purely local differences in rainfall quite aside from the characteristics of the large surrounding areas.

In addition to the tables, four charts are given, showing the rainfall for the growing season, April to July, inclusive, at Helena, Havre, Miles City, and Bozeman. The records available lend no support to the belief that the plowing up and cropping of the soil causes an increase in rainfall. "No human activities have been able to bring about any perceptible change in either rainfall or temperature. There is no argument whatever for this in Montana when we consider that not over 10 to 12 per cent of the land area of this State is plowed or cropped each year, and probably not over 25 to 30 per cent will ever be plowed. It is true, however, that the extremes of wet and drought which recur in all localities are most severely felt where from inexperience or lack of means the settlers have not arrived at a permanently satisfactory method of planning and operating their farms so as to meet these adverse conditions with least loss."

Data are given which show that the monthly mean temperature during the growing season of 1919 was higher than that of any preceding year recorded. Limited observations on humidity indicate that dry periods are apt to be windy, and that periods of little rainfall and high temperature are times of low humidity of the air.

[Weather at Crookston, Minn., seasons of 1917 and 1918], C. G. Selvig (*Minnesota Sta., Rpt. Crookston Substa., 1917–18, pp. 11–15, figs. 3*).—Observations at the substation at Crookston, Minn., on precipitation and killing frosts, 1897–1918, and on temperature, 1916–1918, are reported, and the general weather conditions of the seasons of 1917 and 1918 are briefly described.

The season of 1917 was as a whole the driest on record, the precipitation being 10.79 in. as compared with an average of 21.1 in. for the 21 years, 1897–1918. "The growing season was 35 days less than the average. The latest frost was recorded on June 1 and the earliest killing frost in the fall on September 2. Corn failed to mature. Grass crops were short. Grain crops were of excellent quality and on carefully tilled soil gave an average yield. . . .

"The precipitation in 1918 was 18.07 in. The season was one of the earliest on record, the first seeding being done April 2. While 3.06 in. of rain fell during April and 2.96 during May, it came at intervals which did not prevent spring seeding. Corn, however, received an unfavorable start. The season was 14 days shorter than the average. As a result very little corn matured. The latest frost in the spring was recorded on May 21, and the earliest in the fall on September 8. . . . The season was very favorable for grain crops, the station fields and plats yielding above the average."

Meteorological data, R. W. Edwards (*Texas Sta. Bul. 253* (*1919*), *pp. 8–10*).—Tables are given which show monthly and annual precipitation at the Chillicothe substation, Texas, from 1906 to 1917, inclusive, with monthly and yearly averages and monthly maximum, minimum, and mean temperatures at the same place from 1913 to 1917, inclusive.

The average annual rainfall for the 12 years 1906 to 1917 was 24.09 in., varying from 12.59 in. in 1917 to 34.81 in. in 1915. The temperature records show that "the winter temperatures do not usually fall below zero. Summer temperatures are relatively high, and thus plants requiring much heat, as, for instance, cotton and certain sorghums, which are more or less subtropical in their nature, reach maturity with certainty. These high temperatures are moderated somewhat by the dryness of the air. Rather dry atmosphere is not detrimental to such crops as sorghum and cotton, but it does have an adverse effect on corn, soy beans, and other crops which require a more humid atmosphere for their maximum production."

SOILS—FERTILIZERS.

Parallelism of the soils developed on the gray drifts of Minnesota, C. O. Rost (*Thesis, Univ. Minn., 1918, pp. 68, pls. 12*).—A study of the relation of the chemical composition and the physical properties of certain glacial soils of Minnesota to the age of the drift upon which they have been developed is reported.

Ten virgin fields were sampled on each of three types, the loam and silt loam of the Carrington series and the silt loam of the Fargo series, representing, respectively, forest, upland grassland, and lowland grassland. The samples were taken to a depth of 3 ft. in four separate sections, the first 6 in., the second 6 in., and the second and third feet. Five fields on a fourth soil type, Marshall silt loam, developed only upon the loess overlying the Kansan till, were included in the study and treated similarly in so far as part of the determinations are concerned. Three of these were still in virgin forest and two were adjacent to land that had been cleared and given over to farming.

It was found that the texture of the fine earth of each type, as indicated by the moisture equivalent, is very similar on both drifts, but the proportion of coarser fragments is lower in the soils on the Kansan than in those on the Late Wisconsin. On the older formation, the original fragments of the softer rock (limestones, shales, and cherts) have almost entirely given way to the processes of weathering throughout a depth greater than 3 ft. A general relation was found to exist between the calcareousness and the texture, the finest textured soils retaining the most carbonate and the coarsest the least.

With the two soils of the Carrington series the degree of acidity, as indicated by the litmus, the Truog, and the ammonia methods, is the more pronounced on the Kansan. With the loam the carbon dioxid content is alike on both drifts, carbonates having been removed to a depth in excess of 3 ft., but with the silt loam (although on the Kansan the leaching has been as extensive as on the preceding type) considerable amounts of carbonate still remain in the third foot on the Late Wisconsin. On the fields of the Fargo type much less carbonate has been removed in the case of either drift, and the reaction is less frequently acid on the Kansan than on the younger drift. On the Kansan the calcium carbonate has been leached out to a depth greater than 3 ft. on both the Carrington types, while on the Late Wisconsin the same is true for the Carrington loam, but there is still an appreciable quantity in the third foot-section of the Carrington silt loam. The lime, other than that in the form of carbonate, is similar both in amount and distribution on the two Carrington types, but in the first 2 ft. in the Fargo silt loam it is considerably higher on the Kansan. The magnesia in each type is very similar from drift to drift, but is considerably higher in the Fargo silt loam than in the other types. The ratio of total lime to magnesia is slightly higher on the Late Wisconsin. The ratio of lime in the form of silicate to magnesia is very similar for each type from drift to drift, except with the Fargo silt loam, where it is lower on the younger formation.

The phosphoric acid is higher on the Kansan; this being true for each of the three types. On the two prairie types it shows a decrease from the surface downward, but with the forest type the vertical distribution is irregular. Both potash and soda are very similar in corresponding sections from the two drifts, except that with the Carrington loam the potash is slightly higher and soda distinctly lower on the later glaciation.

In volatile matter the corresponding sections from the two drifts are very similar, except that the Fargo silt loam in the surface 6-in. section shows nearly twice as much on the Kansan as on the Late Wisconsin. The organic carbon, both in amount and distribution, is very similar from drift to drift with both of the Carrington types, but in the first two sections of the Fargo silt loam it is higher on the Kansan, in this resembling the volatile matter. The forested fields show lower percentages than those on the grassland. The distribution of nitrogen resembles that of organic carbon and volatile matter. In relative darkness of color there is no difference between the drifts in the case of any of the soil types, except in the surface 6-in. section on the Carrington loam and the second and third foot-sections on the Fargo silt loam. With these the soil on the Late Wisconsin is somewhat darker.

"If the three types of soils, studied in detail, were to be classified according to the Russian system, the Fargo silt loam would be considered a true chernozem, the Carrington silt loam a chernozem in the early stages of degradation, and the Carrington loam a degraded chernozem. In general, the first 3 ft. of soil on the well-drained areas, originally similar in topography and profile and later covered by the same type of vegetation, are almost identical on the two drifts, which would suggest that the age of the most recent glaciation is so great as to have permitted the uniformity in climate and in vegetative cover, which has prevailed on the two sides of the dividing line in any locality, to almost completely obliterate the effects of the great difference in age."

The soils of Jackson County, H. V. TARTAR and F. C. REIMER (*Oregon Sta. Bul. 164 (1920), pp. 62, pl. 1*).—This bulletin is intended to supplement a previous report on a soil survey of the Medford area, as conducted by the Bureau of Soils of the U. S. Department of Agriculture (E. S. R., 31, p. 513), and reports the results of chemical analyses of samples of the representative soils of Jackson County in southern Oregon, together with some of the progress results of fertilizer experiments. The area discussed covers about 348,160 acres of valley and adjacent hill and mountain land which are mainly of residual and alluvial origin. The average texture of these soils is a clay loam. The drainage conditions are in general good.

The chemical analyses show (1) that there is an abundant supply of potassium, calcium, and magnesium, (2) that none of the soils are acid, some of them containing considerable amounts of limestone, (3) that the phosphorus supply is only fair in some types and low in others, (4) that the nitrogen content (also organic matter) is prevailingly low, in some cases being already deficient for the maximum growth of nonleguminous crops, and (5) that sulphur is present in most of the soils in very limited quantities, and its supply is one of the most limiting factors in the growth of crops, making large demands for this plant food.

"The soils of Jackson County can be made far more productive by liberating the latent plant food in them. This can be done by deeper plowing, fall plowing, increasing the humus content, proper handling and application of all the stable manure, rotation of crops, the growing of legumes, and irrigation and drainage wherever needed.

"The only fertilizers that have produced marked increases in yield are sulphur fertilizers for the legumes, nitrogen for fruit trees and grains, especially in the lighter soils, phosphorus when used in conjunction with sulphur on alfalfa on some of the poorer soils. Potash has been of value on only one ranch, where the soil is an old swamp bed largely composed of vegetable matter."

Soil investigations (*California Sta. Rpt. 1919, pp. 59–65*).—The results of a number of studies on the physics, chemistry, and bacteriology of California soils are summarized.

Experiments on nitrification indicate that while nitrogen is the limiting plant food element in California soils, the limiting factor in crop production is not the incapacity of the soil to effect nitrification. Studies on the effect of soluble salts on soil by W. P. Kelley indicate that sodium salts set calcium free from the soil silicates, equivalent amounts of sodium becoming insoluble. The extent of the replacement is proportional to the concentration, and the reaction conforms to the mass action formula and is reversible. The degree of replacement is widely variable in different soils, being greatest in heavy and least in sandy soils. Potassium and ammonium salts produce similar effects. Calcium salts replace magnesium. Chlorids, sulphates, and nitrates are only slightly absorbed by soils, and phosphates are absorbed to some extent. Neutral soils have the power of neutralizing considerable amounts of sodium carbonate, this being more marked in heavy soils than in light soils.

Studies by D. D. Waynick demonstrated that soils may vary strikingly within the smallest distances at which they can be sampled practicably. Greenhouse experiments on the relative availabilities of nitrogenous fertilizers in California soils deficient in nitrogen, using barley as a crop, showed that ammonium sulphate is superior to all other nitrogenous fertilizers, followed in order by sodium nitrate, calcium nitrate, dried blood, high-grade tankage, and steamed bone meal. In connection with these experiments, C. B. Lipman and W. F. Gericke found that the addition of sulphur to fertilizers resulted in as good yields with sodium nitrate as with ammonium sulphate, which is taken to indicate the need of these soils for sulphur. Greenhouse studies by Lipman with barley on the availability of peat nitrogen in sand soil, in which the peat was used untreated, treated with steam under pressure for three hours, and treated with weak sulphuric acid and then with steam under pressure, showed that no significant differences were obtained between controls and the peat-treated cultures. This is taken to indicate that peat is practically useless as a source of available nitrogen to crops in California soils. Experiments by Wright on the decomposition of soil minerals by bacteria indicate that the acid produced by bacteria, chiefly carbonic acid, is responsible for the solvent effects on minerals, and it is the opinion that bacteria are, therefore, concerned in the supply of available minerals to plants.

Studies on the fixation of nitrogen by Azotobacter by Waynick and Woodhouse indicate that a very large percentage of the total nitrogen fixed in the first studies of growth of Azotobacter in culture consists of amino-acid nitrogen. This is taken to indicate that the elementary nitrogen passes through the simple organic forms before it is made into protein forms, and that the nitrogen is fixed by combination with hydrogen and not with oxygen. Studies by D. R. Hoagland and A. W. Christie on the effect of irrigation waters on the osmotic pressure and reaction of various soils led to the conclusion that an irrigation water may produce a much more injurious effect on a sandy soil than on a heavy one.

[Work in soil chemistry and bacteriology at the New Jersey Stations, 1918], J. G. Lipman and A. W. Blair (*New Jersey Stas. Rpt. 1918, pp. 181-184*).—This report notes the progress in experiments on the availability of nitrogen and on the accumulation and utilization of nitrogen in field and cylinder experiments during 1918 (E. S. R., 40, p. 125), and reports a reorganization of the gypsum and iron sulphate experiments. A partial summary of the nitrogen availability experiments has been previously noted (E. S. R., 39, p. 817).

The results so far secured on the gypsum and iron sulphate experiments do not seem to justify the continuation of the experiment in accordance with the original plan, and it has been decided to make a change in both the rotation and fertilizer treatment. The eight plats have been divided into two sections, four plats constituting a nonlegume and four plats a legume section. Two plats in each section will receive potassium chlorid at the rate of 50 lbs. per acre annually. Tho other two plats in each section will receive no potash. The rotation is to be as follows: 1918, all plats in corn (winter vetch on legume section); 1919, all plats in oats, followed by buckwheat on nonlegume section and soy beans on legume section, as green manure crops; 1920, all plats in wheat; 1921 and 1922, two plats in each section in timothy, and two plats in each section in timothy and clover.

Soil moisture studies on heavy soils (*California Sta. Rpt. 1919, pp. 13, 14*).—Moisture studies in citrus groves on heavy types of soil by E. E. Thomas have shown that irrigation furrows should not exceed 250 or 300 ft. in length in such soil, and that much better results are obtained by the use of a 45 or 60-day interval between irrigations. Less frequent and more thorough cultivations are also considered necessary on such soils.

Improved hydraulic agriculture in swamps, sand wastes, and arable soils, B. Petrocchi (*Atti R. Accad. Geogr. [Florence], 5. ser., 16 (1919), No. 4,* *pp. 201–227, pl. 1, fig. 1*).—A plan is outlined, based on preliminary studies for the reclamation of swamps and sand waste soils, and for the improvement of the arable soils of an area of about 40,000 acres in the neighborhood of the cities of Pisa and Livorno, in Italy.

Alkali investigations (*California Sta. Rpt. 1919, pp. 65–67*).—A survey by W. P. Kelley et al. of the irrigation water supplies in use throughout the citrus and walnut belt of California indicates that the major portion is of excellent quality but that a considerable portion contains alkali. The poorer water usually comes from wells. In a few cases as much as 2 tons, and in a still greater number of cases from ½ to 1 ton, of alkali is being added to the soil per acre per annum.

Studies by C. B. Lipman and L. T. Sharp on the chemical treatment of alkali land showed that where about 50 tons of strong sulphuric acid were sprayed on 40 acres of alkali soil there was a clear improvement in the productive power of the soil, but not great enough to justify the sulphuric acid treatment in practice. The effect of the treatment seemed to decrease the second year and showed a tendency to disappear. Treatment with sulphur gave no results.

A greenhouse experiment by Lipman and W. F. Gericke on the effect of barnyard manure on alkali showed that applications at the rate of 20 or more tons per acre prevented partly or wholly the injurious effects of excessive amounts of alkali salts in the soil growing barley. This treatment seemed almost without effect in the fifth season. Experiments on the influence of heavy metals on alkali salts showed that with barley the sulphates of copper, lead, zinc, iron, and manganese may prevent any considerable injury by common salt, sodium sulphate, or sodium carbonate when present in the soil in toxic concentrations.

Soil alkali, F. S. HARRIS (*Utah Sta. Circ. 41* (*1920*), *pp. 3–7, fig. 1*).—Popular information is given regarding alkali in semiarid soils, its action toward crops, and methods of reclamation of alkali land. It is stated that the native vegetation and a chemical analysis of the soil to a depth of at least 6 ft. make an excellent combination in determining the degree of contamination of alkali land. If sagebrush is growing vigorously it may be assumed that the alkali content is not excessive. On the other hand shadescale, greasewood, saltweed, and salt grass all indicate the presence of dangerous quantities of alkali. Drainage and the proper use of irrigation water are considered the quickest and most effective means of reclaiming alkali land.

Crop yields on the Golden Valley peat experimental fields in 1918, F. J. ALWAY and C. G. SELVIG (*Minnesota Sta., Rpt. Crookston Substa., 1917–18, pp. 90–93, fig. 1*).—Experiments with 16 different grain, hay, and root crops on a peat soil from 12 to 36 in. deep, underlaid by black muck and yellowish gray clay loam, are reported, the treatments being manure, phosphate, and potash, and burning. With one or two exceptions there were marked crop increases resulting from manure, phosphate, and burning. It is considered evident that these soils need available phosphoric acid, and the benefit of burning is ascribed to the fact that the peat ash is regarded as a low-grade phosphatic fertilizer. It is considered probable also that potash will be required within a few years on part of these peat soils.

"As most of the grass-covered peat lands of Marshall, Pennington, Clearwater, Polk, Kittson, and Roseau Counties, and the western part of Beltrami County appear similar in origin and composition to those at Golden Valley, it is not improbable that most of them will behave similarly with phosphate, manure, and burning. Peat landowners in these districts are advised to experiment on their own fields with acid phosphate on a small scale."

The effects of nitrate of soda on soils (*California Sta. Rpt. 1919, p. 14*).—Experiments by W. P. Kelley showed that after sodium nitrate was used annually for a period of 11 years on citrus trees the trees became wholly unprofitable and showed the most extreme symptoms of mottle-leaf. Soil studies showed that at first calcium was set free by sodium nitrate, producing beneficial effects. In course of time the available calcium became reduced to a low point, and further applications of sodium nitrate brought about excessive concentrations of soluble sodium in the soil solution. Concurrently, the soil became greatly deflocculated and impervious.

British synthetic ammonia developments (*Amer. Fert., 52* (*1920*), *No. 6, pp. 80, 97, 100, 104*).—Attention is drawn to the proposed establishment in Great Britain of the so-called Claude synthetic ammonia process which increases the pressure of combination from 200 atmospheres, as used by the Germans, to 1,000 atmospheres without reducing the temperature at which the combination is effected. "By increasing the pressure of reaction to 1,000 atmospheres the yield of ammonia is increased fourfold, up to 50 per cent. while the speed of reaction is commensurately increased. The power required to compress to 1,000 atmospheres is admittedly greater than to 200 atmospheres, but there are some essential advantages secured, which in the final result makes the total power expended per ton of synthetic ammonia produced no larger than what is required for compression at 200 atmospheres."

The report of the British Nitrogen Products Committee is also summarized.

The utilization of dead animals and organic wastes, in the manufacture of superphosphates containing nitrogen, A. MORVILLEZ (*Indus. Chim.* [*Paris*], *5* (*1918*), *p. 150; abs. in Chem. Zentbl., 1919, IV, No. 6, p. 181*).—The manufacture of a nitrogen superphosphate from 100 kg. of flesh, 90 kg. of sulphuric acid, and 200 kg. of raw phosphate is described. It was found that 350 kg. of superphosphate was obtained, containing from 1.5 to 2 per cent of organic nitrogen and 18 to 20 per cent of citrate-soluble phosphoric acid.

Barium phosphate experiments, A. W. BLAIR (*Amer. Fert., 52* (*1920*), *No. 7, pp. 142, 144*).—Experiments conducted at the New Jersey Experiment Stations with barium phosphate in comparison with barium sulphid, basic slag, raw rock phosphate, and acid phosphate, are reported. The soil used was a sassafras loam and the crops grown were soy beans and corn. The barium phosphate was added at the rate of 600 lbs. per acre and the other phosphates at the rate of 300 lbs. per acre.

There was little difference between the check plats and those treated with phosphates. The opinion is expressed that barium phosphate should not be condemned without further trial, but "farmers should note that it is a low-grade, slowly available material and that the price which is now being asked for it is only a little below the price of acid phosphate, which is a thoroughly tried and readily available material."

Conditions in the European phosphate market, W. C. PHALEN (*Amer. Fert., 52* (*1920*), *No. 5, pp. 138, 140, 142, 144*).—It is stated that indications in the European fertilizer market point to a prosperous condition caused chiefly by the growing demand for all classes of fertilizer material in spite of a shortage of supplies. It is reported that phosphate rock has been found in Drenthe and Overyssel Provinces in northeastern Holland. Analyses show the material to be of a low grade, containing only 25 to 30 per cent of calcium phosphate, but it is considered to be of great value as a fertilizer. Low grade phosphate rock deposits are also reported as existing in the Twente District in eastern Holland. While difficult and expensive to mine, about 30 tons of from 15 to 20 per cent material are being produced daily.

Data on the consumption of phosphates in France are reported, and it is stated that the future policy of the French Government will be to regulate the exportation of African phosphate rock for many years to insure an adequate home supply. The estimated needs for France in 1919 are given as 1,100,000 tons of phosphate. It is estimated that approximately 2,000,000 tons of superphosphate can be used annually to great advantage in Spain. Brief data are also given on the phosphate situation in Italy.

Potash recovery at cement plants, A. W. G. Wilson (*Canada Dept. Mines, Mines Branch Bul. 29 (1919), pp. 34, pls. 6*).—Investigations on progress in the development of successful processes for recovering potash from flue dust in a form suitable for industrial purposes are reported and summarized.

A list of 50 references to literature bearing on the subject is appended.

German potash production and prices (*Amer. Fert., 52 (1920), No. 5, pp. 67–69*).—Data on the production, use, and export of potash in Germany are reported. It is stated that the total production of actual potash for 1919 was 946,000 short tons, of which 264,000 tons were sold abroad, the remainder meeting about 41 per cent of home requirements. A further increase in the schedule of prices of potash for domestic consumption is announced, amounting to about 45 per cent.

It is noted that the new prices are about six times as high as the prices in force at the beginning of the war. Expressed in terms of marks per American unit, or 1 per cent of actual potash per short ton, the new price of potash for domestic consumption are as follows: Crushed carnalite, containing from 9 to 12 per cent actual potash (K_2O), 4.64; crushed crude salts, containing 12 to 15 per cent actual potash, 5.45; manure salts, containing 20 to 22 per cent actual potash, 6.78; manure salts, containing 30 to 32 per cent actual potash, 7.55; manure salts, containing 40 to 42 per cent actual potash, 8.82; muriate, containing 50 to 60 per cent actual potash, 10.46; muriate, containing 61 per cent K_2O, 11.46; and sulphate of potash, containing 42 per cent K_2O, 13.82.

Production problems are also discussed.

Spanish potash: Good prospects but Government inactivity (*Amer. Fert., 52 (1920), No. 6, pp. 57, 58*).—It is stated that in the area that has been investigated in Spain in the neighborhood of Suria there are approximately 10,000,000 tons of anhydrous potassium oxid worth about $731,000,000 on a prewar basis. Other less important areas are briefly described. A complaint is voiced against Government inactivity with reference to the Spanish potash deposits.

The limestone deposits of New South Wales, J. E. Carne and L. J. Jones (*N. S. Wales Geol. Survey, Min. Resources Ser. No. 25 (1919), pp. XII+411, pls. 91, figs. 11*).—This report deals in considerable detail with the distribution, nature of occurrence, composition, and characteristics of all the known limestone deposits of New South Wales, and describes the present condition of the lime, cement, and marble industries and the possibilities of their further development. It is stated that limestone is widely distributed in New South Wales, the more important deposits occurring within the central and eastern portions of the State.

"The great bulk of the limestones of New South Wales are remarkably low in magnesia contents, and though the occurrence of dolomite as a mineral in veins and ore channels has frequently been noted, the workable deposits of high-magnesian limestones are few."

Numerous analyses of samples of limestones are included.

[Soils], M. J. Funchess (*Alabama Col. Sta. Rpt. 1919, p. 19*).—Further studies at the station on the toxicity of soluble manganese in acid soils (E. S. R., 39, p. 627) showed that manganese may be regarded as a very good indicator of an acid condition, but that of itself it is not likely to produce harmful effects unless present in very large amounts. The toxicity of certain soil extracts was apparently due more to the acidity of the solution, or to the combined effect of acid and aluminum, than to the manganese, which was frequently found. The results obtained by means of seedling cultures in soil extracts indicated that manganese carbonate may lower the acidity of such extracts and thus render the solutions better mediums for growth.

Efforts to determine whether salts of aluminum were toxic, more because of the acidity of such salts than because of the direct effect of the aluminum, gave disappointing results, since the aluminum could not be kept in solution when the acidity was destroyed. Certain plants, like velvet beans and peanuts, appeared to be more able to throw the aluminum out of solution by neutralizing the acid than other plants, such as clover or Melilotus seedlings.

In recent work several soils from north Alabama gave very acid extracts after incubation with dried blood. It was shown that each of these soils from which very acid extracts were obtained supported nitrification of dried blood, and that soluble manganese was present in large quantities in most cases.

This work is to be continued.

The large-scale use of carbon-dioxid fertilization, F. Riedel (*Mitt. Deut. Landw. Gesell., 1919, pp. 427, 451, 467; abs. in Chem. Ztg., 43 (1919), No. 121-123, Beilage, p. 245*).—Experiments on the use of carbon-dioxid gas from blast furnaces in hotbeds and in open fields are reported. The gas was conducted from the blast furnaces through pipes. In the hotbed experiments it was found that the yield of tomatoes in the gassed soils was 2.75 times that in the ungassed soils, and the yield of cucumbers 1.7 times that in the ungassed soils.

Experiments on open plats with a number of crops, including beets, potatoes, barley, and lupines showed large increases in all cases in favor of the gassed soils. The method of securing and applying the gas is described.

The use of cane molasses as a fertilizer, Lindet (*Compt. Rend. Acad. Agr. France, 5 (1919), No. 28, pp. 737, 738*).—A brief summary of information relative to the cause of the crop increases from the use of molasses on soils leads to the conclusion that this is due not to the potash in the molasses, but either to a favorable influence on the nitrogen-fixing bacteria or to an increase in the solubility of soil elements.

Crop injury by borax in fertilizers, O. Schreiner, B. E. Brown, J. J. Skinner, and M. Shapovalov (*U. S. Dept. Agr., Dept. Circ. 84 (1920), pp. 35, figs. 25*).—Earlier experiments and observations by others bearing on the subject are reviewed, and preliminary field experiments on the influence of a Searles Lake potash salt containing 6.25 per cent borax ($Na_2B_4O_7$) when used in complete fertilizers having from 2 to 8 per cent potash on potatoes and cotton are reported, which were carried out in cooperation with farmers in the States of Maine, New York, New Jersey, Virginia, North Carolina, South Carolina, and Georgia.

Investigation of cases in certain sections growing potatoes and cotton indicated the use in fertilizers of potash salts containing borax in what proved in practice to be excessive quantities. The higher the potash content of such mixed fertilizers the higher was also the borax content and the greater the damage to the crop. This damage was greatest when the fertilizer had been drilled in with the seed, and was more severe where the soil and climatic conditions were such as to leave the fertilizer and seed, or the sprouting seed, too long in contact with the borax-containing salts. The greatest damage was done to germination, which was either entirely prevented or much delayed, sometimes many weeks. This showed itself in many missing hills, producing a poor stand and consequently a reduced yield.

It is not thought likely that damage of a permanent character has resulted this year on the fields subjected to this borax trouble. This is indicated by the fact that rainfall immediately following the application of the fertilizer, a moister condition of the soil when applied, a slightly reduced quantity used, owing to the improper regulation of the drill, or a better distribution in the soil, especially when broadcasted, all tend toward a marked reduction, even to the vanishing point, in the harmful effect of the borax.

Analyses showed that the borax content in many commercial mixtures found on affected farms was rather high, varying from 0.73 to 2.3 per cent. An examination of the potash salts occurring in commerce showed that some contained as much as 12, 20, and even 30 per cent of borax.

In the field experiments no such serious injury has resulted as occurred in commercial fields, but even here the yields were materially affected.

In addition, greenhouse studies with pots to obtain data on the limits of toxicity of borax are reported. A large number of fertilizer mixtures were used with wheat and cotton as the plant indicators of toxicity, and with a much wider range of borax content than was feasible in the field experiments. This indicated for wheat plants a toxic limit of 2 to 3 lbs. of borax per acre, while with cotton this toxic limit appeared to be higher, between 8 and 9 lbs. per acre. The reactions were in all cases decisive and left no doubt as to the poisonous action of the borax on the plants.

Inspection of commercial fertilizers for the season of 1919, H. D. Haskins et al. (*Massachusetts Sta. Control Ser. Bul. 12* (*1919*), *pp. 3–77*).—This bulletin contains the results of actual and guarantied analyses of 615 samples of fertilizers and fertilizing materials collected for inspection in Massachusetts during 1919, together with a list of manufacturers and brands, and data on composition, cost, and valuation of crude stock materials.

A study of the nitrogen used in the mixed complete fertilizers for 1919 showed that the average total nitrogen found was 2.65 per cent, made up of nitrates and ammoniates 1.35 per cent and organic nitrogen 1.3 per cent. The average total nitrogen found in ammoniated superphosphate was 3.5 per cent, of which nitrates and ammoniates made up 1.56 per cent and organic nitrogen 1.94 per cent. Of the total phosphoric acid found in the complete mixed fertilizers, 85.5 per cent was present in available form and 66.4 per cent of the available phosphoric acid was in water-soluble form. In the case of the ammoniated superphosphates, 87.9 per cent of the total phosphoric acid was in available form and 61.2 per cent of the available phosphoric acid was in water-soluble form.

The average complete fertilizer contained 1.88 per cent of water-soluble potash. Out of a total of 119 brands analyzed, 47 failed to meet the minimum potash guaranty and 64 fell below the minimum guaranty in one or more elements. Out of the 159 brands of ammoniated superphosphates analyzed, 34 fell below the minimum guaranty in one element, but none of the brands were deficient in both elements. Other valuation data are included.

[Fertilizer analyses], R. E. Rose and F. T. Wilson (*Fla. Quart. Bul. Dept. Agr., 30* (*1920*), *No. 1, pp. 42–64*).—Special analyses of 284 samples of fertilizers and fertilizing materials taken by purchasers in Florida during 1919 are reported, together with actual and guarantied analyses of 4 samples of fertilizing materials termed illegal and collected for official inspection.

Analyses of fertilizer by the Department of Agriculture for 1919 (*Va. Dept. Agr. and Immigr. Buls. 145* (*1919*), *pp. 10–30; 146* (*1919*), *pp. 11–25; 147*

(*1919*), *pp. 9–24*).—Actual and guarantied analyses of 513, 335, and 370 samples of fertilizers and fertilizing materials, and 5, 8, and 11 samples of lime, respectively, as made by the Virginia Department of Agriculture during 1919, are reported in these publications.

Analysis of fertilizer by the Department of Agriculture for 1919 (*Va. Dept. Agr. and Immigr. Bul. 149* (*1920*), *pp. 8–11*).—Analyses are reported of 56 samples of fertilizers and fertilizer materials, 8 samples of lime, and 2 samples of lime and potash, offered for sale in Virginia during the fall of 1919 and found to be deficient within the terms of the fertilizer inspection law.

AGRICULTURAL BOTANY.

Effect of the relative length of day and night and other factors of the environment on growth and reproduction in plants, W. W. GARNER and H. A. ALLARD (*Jour. Agr. Research* [*U. S.*], *18* (*1920*), *No. 11*, *pp. 553–606*, *pls. 16*, *figs. 3*).—The results are given of investigations carried on by the authors in the Bureau of Plant Industry, U. S. Department of Agriculture, in which a dark chamber was used for growing plants, by which the number of hours of exposure to sunlight could be controlled. As a part of the investigation, a series of plantings of soy beans was made in the field at intervals of three days throughout the season, in order that the effects produced by different dates of planting could be compared with those produced by artificial shortening of the daily exposure to light.

Tobacco, soy beans, and a large number of other plants were experimented with, and it was found that the relative length of the day was an important factor in the growth and development of the plants, particularly with respect to sexual reproduction. In some species it was found that the normal plant could attain flowering and fruiting stages only when the length of day falls within certain limits. Consequently, these stages of development are ordinarily reached only in certain seasons of the year. In the absence of favorable length of day for bringing into expression the reproductive processes in certain species, vegetative development was said to continue more or less indefinitely, thus leading to the phenomenon of gigantism. On the other hand, under the influence of a suitable length of day, precocious flowering and fruiting may be induced. In this way certain varieties or species may act as early or late maturing, depending on the length of day to which they happen to be exposed. The species exposed to a length of day favorable to growth and sexual reproduction have shown a tendency to assume an ever-blooming or ever-bearing type of development.

The relationship between annuals, biennials, and perennials was studied, and under artificial conditions it was found possible to change the nature of the plants materially. In all species studied the rate of growth was found directly proportional to the length of the daily exposure to light, but within the limits of the experiment light intensity was not found a factor of importance. With soy beans, limiting water, inducing temporarily wilting daily, was without effect on the date of flowering, although the drought hastened the final maturing of the seed. Interrelationships between length of day and prevailing temperatures of the winter season are said to control successful reproduction largely in many species and their ability to survive in certain regions. The authors point out that the relation between the length of the day and the time of flowering is of great importance in crop yields, and indicates the necessity for seeding at the proper time.

[**Botanical studies by the California Station**] (*California Sta. Rpt. 1919*, *pp. 14*, *15*, *67*, *68*).—The effects of alkali on citrus have been found by W. P.

Kelley to vary widely for different localities. They are usually marked by chlorosis, mottling, yellowing, or burning of the leaf margins or tips, perhaps also premature defoliation. In all these cases, fruit yield and quality are usually impaired, and in extreme cases the trees become unprofitable. Lemons are more sensitive than oranges to alkali. Suitable manuring, watering, and drainage offer promise of success in restoring normal conditions.

The composition of normal citrus trees is said to alter rapidly as growth proceeds. The young leaves contain relatively high percentages of nitrogen, phosphorus, and potassium, which attain their maximum during the first 6 or 8 weeks of growth and decrease considerably just before the leaves fall normally. Calcium exceeds potassium after the first week, and attains to 5 per cent or more of the dry weight of the leaf at maturity.

Mottled as compared with normal leaves contain less calcium and more potassium, phosphorus, and nitrogen. Trees showing mottled leaf are abnormal in not securing the requisite calcium and in absorbing excessive amounts of potassium. This tendency, though most marked in the leaves, is evident in other portions of the tree.

The casual variability in the yields of orange, lemon, walnut, and apple orchards has been determined by L. D. Batchelor and H. S. Reed with special reference to its bearing on the value of small plat trials as compared with larger, continuous plats, knowledge of the normal yield of a plat often being important in comparisons.

Critical studies on culture solutions for plant growth have been made by D. D. Waynick, the object being to eliminate errors in method and to appraise past work in the light of knowledge of such errors. Briefly stated, it has been shown that the sizes of containers for culture solutions have been too small in the past, and that difference between so-called good and poor solutions almost disappear or lose significance when studied on a statistical basis. It is found, also, that the season is an important factor as to differences between good and poor solutions, the differences being much greater between the two in the late spring than in the winter under greenhouse conditions at Berkeley. The variability in the growth of the plants in the poor solution is much greater than that of the plants in the good solution.

A new method of obtaining the soil solution has been devised by C. B. Lipman, which is said to be simple, direct, and efficacious.

The rôle of the tapetum, M. MASCRÉ (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 22, pp. 1120–1122, figs. 4*).—The author gives an account of studies intended to furnish precise information regarding the nature, behavior, function, and fate of the tapetum, chiefly in *Datura arborea* (*Brugmansia candida*), and as confirmed by observations on other species.

This layer is said to accumulate nutritive materials in a dissolved condition in the cellular vacuoles. These materials are afterwards transformed, resulting in the elaboration of starch, fats, and other bodies, which are delivered to the pollen. This activity is followed by the degeneration of the tapetal cells and the nuclear multiplication and other modifications which, are in close relation with their functions and alterations thereof. The tapetal layer is, therefore, clearly defined by its functions, which are nutritive and secretory, conforming in the course of their evolution to the general laws of cellular biology.

The absorbent power of root tips, H. COUPIN (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 10, pp. 519–522*).—Experimentation with peas as here outlined has led the author to the conclusion that root tips possess absorbent power as regards water, and that this power permits the plant to attain the maximum growth consistent with the available quantity of nutritive substances and with other conditions.

The transformation of the plant ovule into an ovary, J. A. HARRIS (*Proc. Soc. Expt. Biol. and Med., 16 (1919), No. 8, pp. 134–136*).—In a study of basal and of placental prolification in fruits of *Passiflora gracilis* it was found that the former occurred in about 3.33 per cent and the latter in 0.039 per cent of the cases. Both occurred at the same time in 18 individuals out of the 568,098 fruits examined. Basal prolification, while presenting morphological problems, is considered for reasons stated as not having the physiological significance attaching to placental prolification.

Germination of barley pollen, S. ANTHONY and H. V. HARLAN (*Jour. Agr. Research* [*U. S.*], *18 (1920), No. 10, pp. 525–536, pls. 2, figs. 2*).—Experiments were conducted by the Bureau of Plant Industry, U. S. Department of Agriculture, to determine the viability of barley pollen in various solutions and in different moist chambers. Extensive studies were also made of fertilization under field conditions, using pollen in eight successive stages of development.

The artificial germination of the pollen was found very difficult, but under properly controlled moist chamber conditions a certain degree of success was attained. It was found that a proper range of humidity must coincide with a certain range of temperature. The retention of viability by barley pollen when stored under various conditions was studied, but no satisfactory results were obtained. A study of the conditions governing fertilization in nature is said to show that conditions unfavorable to fertilization are also unfavorable to progress in the development of pollen and vice versa. In this way natural fertilization is assured.

Diœciousness in Thalictrum dasycarpum, J. H. SCHAFFNER (*Ohio Jour. Sci., 20 (1919), No. 2, pp. 25–34*).—The author contributes to the general problem of the nature of diœciousness a number of observations made on *T. dasycarpum* as representing a genus of plants quite low in the evolutionary scale yet showing considerable specialization. This species presents no important sexual dimorphism as between staminate and carpellate plants except in the sporophylls themselves, and but little between stamens and carpels before the final elongation of the filaments.

A considerable percentage of the individuals are apparently strictly staminate or carpellate, and from these extremes, intermediates grade up through all degrees to individuals which produce nearly an equal number of stamens and carpels. The intergradation as regards sexual characters is illustrated by examples, and it is thought that almost any degree of expression of maleness or femaleness could be found. Great diversity of sexual expression can be found on different branches of the same inflorescence. In *T. dasycarpum* and some other plants maleness or femaleness may not be expressed until a late stage has been reached in the vegetative growth of the annual shoot. The facts noted in this connection are discussed in their supposed bearings, more particularly on the question of the nature of sex and its developmental history.

Amygdalopersica formonti, G. RIVIÈRE and G. BAILHACHE (*Compt. Rend. Acad. Sci.* [*Paris*], *161 (1915), No. 17, pp. 497–499; 168 (1919), No. 10, p. 525*).—In the first of these two articles, an account is given of the spontaneous development in 1908 of almond shoots on the trunk and branches of old peach trees originally grafted on almond stocks, these shoots being situated as much as 2 meters from the graft union. This phenomenon was examined in 1910 by a Commission of the French National Society of Horticulture and studied by other botanists. The name *A. formonti* was given to this production, which was considered as a graft hybrid by L. Daniel.

Blooms perfectly typical of almond appeared on these shoots each year, 8 to 10 days earlier than on the peach trees (trunk and branches) bearing them. The resulting fruits were typical and during 1915 attained sufficient growth to display characters of bitter and not of sweet almonds. Plantings were made testing fertility and heredity.

Record is also made of the development at other places named, apparently spontaneous, of almond branches on peach trees.

As set forth in the second article, the seed from one of the almond fruits, referred to in the above note, was planted April 25, 1916, and demonstrated fertility in this strain by producing a tree. This has, during three years, displayed only characters which are appropriate to the almond, and which are particularly pronounced as regards the leaves.

It is further stated that in 1917 the original almond shoot produced three more fruits, the seeds of which were planted in 1918 and produced each a vigorous young almond tree. This is regarded as evidencing the normal fertility of *A. formonti*.

Production of glycocoll by Isaria densa, M. Molliard (*Compt. Rend. Acad. Sci. [Paris], 167 (1918), No. 22, pp. 786–788*).—On various protein substrata with certain additions, *I. densa* effects a notable production of glycocoll.

Egg albumin as a complete food for Isaria densa, M. Molliard (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 10, pp. 523, 524*).—Further work with *I. densa* has shown that the utilization of albumin as substratum is more rapid than when this is impregnated with a saccharine solution, and that in the former case a more considerable oxidation also occurs. Other observations are noted. Egg albumin prepared as indicated is said to satisfy all the nutritive requirements of *I. densa*. The phenomena of intense oxidation of egg albumin are thought to be correlated with a very weak respiratory quotient and the formation of oxalic acid.

The relation between the number of chromosomes of a species and the rate of elimination of mongrel blood by the pure-sire method, H. H. Laughlin (*Proc. Soc. Expt. Biol. and Med., 16 (1919), No. 8, pp. 132–134*).—Results with discussion are given of calculations said to show that in breeding as far as the F_8 generation by means of pure male parents in a 12-chromosome species (as illustrated by man) the probability that a given species carries absolutely no mongrel descended chromosome is 1 : 0.205. From this it is concluded that beyond the F_8 generation selection for mass improvement by the pure male method in a 12-chromosome species is practically ineffective.

A Darwinian statement of the Mendelian theory, H. F. Roberts (*Nature [London], 103 (1919), No. 2598, pp. 463, 464*).—The author notes, with discussion, a number of statements by Darwin in his Animals and Plants under Domestication, which he believes constitute virtually a statement of the Mendelian theory of the distribution and recombination of factors in hybrid offspring.

FIELD CROPS.

Report of agriculturist, E. F. Cauthen (*Alabama Col. Sta. Rpt. 1919, pp. 15–18*).—The work in 1919 with cotton, corn, oats, wheat, soy beans, rye, and vetch and other forage crops is briefly noted.

The results of a breeding test with Cook 588 cotton indicated that the appearance of black and green seed, which is an undesirable character, is capable of elimination. Cook No. 1110 cotton surpassed the next most productive variety in the regular variety test by 62 lbs. of lint cotton per acre. Hybrid oat No. 651 is reported as showing resistance to winterkilling. Alabama Bluestem wheat gave a marked increase in yield over Fulcaster and other widely-grown varieties, and matured about 10 days earlier than these. Among varieties of vetch under test Oregon No. 13420 did not lodge badly, remained green to the ground, and showed but little stem disease, while a strain of Angustifolia did not shatter the seed badly when ripe.

In fertilizer experiments on coastal plain soil nitrate of soda and calcium cyanamid, applied under corn at the time of planting and as a side dressing at different stages of growth, gave an increase in yield of 150 per cent and 50 per cent, respectively, but when similarly applied to cotton the yield increases were nearly equal. In a 12-year test with different sources of nitrogen the continuous use of sulphate of ammonia reacted injuriously upon the growth of sorghum and oats. Experiments with different sources of potash as fertilizers for wheat, corn, and cotton on coastal plain soil did not show marked differences in yield.

[Work with] farm crops (*California Sta. Rpt. 1919, pp. 44–52, 70*).—Preliminary studies by J. W. Gilmore and W. W. Mackie are reported as showing that a properly cultivated fallow contains at the close of the season about three times as much soluble nitrogen in the upper 2 ft. as on uncultivated fallow. On a series of plats of the cultivated fallow 44 bu. of wheat and 76 bu. of barley per acre were produced during the somewhat unfavorable season of 1919.

In a series of trials by Gilmore the yield of wheat on plats continuously cropped for 5 years declined from 48.2 bu. to 11 bu. per acre. As compared with these results it is noted that the average yields of 3 plats alternately in wheat and fallow were 15.8 bu., 48.44 bu., and 44.61 bu. per acre in 1914, 1916, and 1918, respectively.

The results of a rotation experiment by Gilmore and B. A. Madson in which wheat was alternated with peas or vetch, and these crops turned under, furnishing about 1,000 lbs. of dry matter per acre, brought out the value of maintaining a favorable amount of organic matter in the soil. The use of sulphate of ammonia and nitrate of soda in growing wheat in different parts of the State on soils insufficiently supplied with available nitrogen was found by C. B. Lipman to be of decided advantage.

Variety tests with barley, conducted for 9 years, are reported by Madson and G. W. Hendry as demonstrating the superiority of Mariout over Coast barley in yielding capacity, drought-resistance, and earliness. Mariout also shattered less than Coast barley. An irrigation study with barley by S. H. Beckett, covering 8 years, indicated that in seasons of deficient rainfall the application of irrigation water produced a material increase in yields up to a total of 22 acre inches of rainfall plus irrigation water. It is concluded from the results that in wet years with a normal distribution of the rainfall the application of irrigation water is not warranted.

A rotation of grain, sugar beets, corn, and potatoes was tested by Beckett 4 years in different combinations under varying irrigation treatment, but no particular rotation of these crops was indicated as being preferable. During the succeeding 4 years the same area was cropped exclusively to grain and beans. The results in general showed a decline in yield, which is attributed to the increasingly poor physical condition of the soil resulting from continuous irrigation without the addition of organic matter.

In work with grain sorghums by Madson and Hendry the selection of the superior heads for seed resulted in yields ranging from 2,500 to 5,000 lbs. per acre as contrasted with less than one-half those yields by ordinary methods. At the University farm on land previously cropped to cereals, Madson and

P. B. Kennedy found that Sudan grass produced 3,554 lbs. of hay per acre with only 8.84 in. of rainfall. Yields of 5 tons of hay per acre were secured in years of normal rainfall, and of 5 to 6 tons per acre with irrigation.

According to studies by Hendry made on alkali tolerance of beans the varieties observed were grouped as follows: Most tolerant—Blackeye, Horse bean, Garbanzo; moderately tolerant—Lima, Tepary; and least tolerant—Small white, Red Kidney, large white, Pink, Red Mexican, Bayo. In this connection a table is given showing the percentage acreage distribution of the several leading varieties for the northern and southern counties, the Sacramento and San Joaquin Valleys, and the Central Coast region. Data presented with reference to the composition of California bean varieties have been previously noted (E. S. R., 39, p. 266).

Notes are given on work by Gilmore and W. S. Wilkinson on the irrigation of cotton in the Imperial Valley and on cotton production in the Sacramento and San Joaquin Valleys. Tests at Kearney Ranch are reported as showing that both the short staple or upland type and the long staple, or Egyptian type, can be grown successfully. Yields of over 2,000 lbs. of seed cotton per acre are recorded for Durango, Yuma, and Pima cotton with a variation of lint from 28 to 32 per cent.

A study by W. E. Packard and Wilkinson of the influence of irrigation in the Imperial Valley on the prevalence of alfalfa roots in different types of soil is reported. It was found that in sandy loam soils where water was applied frequently and in small amounts 54.82 per cent of the roots were in the first foot of soil. Where an optimum amount of water was applied at frequent intervals the percentage of roots for each foot from the first to the sixth was as follows: First, 9.51 per cent; second, 18.1; third, 14.15; fourth, 16.74; fifth, 12.48; and sixth, 8.92 per cent, or a total of 79.9 per cent in the upper 6 ft. of soil. In soils with the water table within 4½ ft. of the surface 70.43 per cent of the roots were in the upper 2 ft. of the soil. A study by T. F. Tavernetti of the labor required to harvest alfalfa, conducted at University farm while harvesting the first crop for the season of 1918, showed that the labor expenditure could be reduced from 6.8 to 5 hours per ton.

Notes by Kennedy on the culture and value of Harding grass (*Phalaris stenoptera*), Smilo grass (*Oryzopsis miliacea*), and Napier fodder (*Pennisetum purpureum*) are presented. The results of analyses by F. W. Albro of ripe and green castor beans, showing that there is practically no difference between the oil content of the ripe and the green beans, are tabulated.

Experiments by G. P. Gray on the chemical control of the morning glory by means of arsenic as a spray on the foliage indicated that a sufficiently high humidity at the time of application to permit the absorption of the poison before the spray dries, and a degree of maturity of the plant permitting a downward movement of the poison to the roots, are absolutely necessary conditions for success.

The growth of sunflowers was studied by H. S. Reed to determine the relative superiority of good plants for plant-breeding purposes. It was found that variations in size were not necessarily due to variations in the soil, moisture, or other external conditions. Plants small at maturity were generally small at the beginning, and those large at maturity showed a well-marked superiority from the start. There was evidence that height is determined by factors distributed at random through the population, and it was found that the distribution of the relative height of the plants was fairly equal. The tallest and the shortest plants were observed as less variable in regard to their mean relative height than plants more nearly of average height.

[Report of field crops work in Minnesota, 1918], A. Boss (*Minnesota Sta. Rpt. 1919, pp. 38–41, 52*).—Descriptions are given of variety, culture, and breeding experiments with cereal, forage, and other field crops for the year ended June 30, 1919. Earlier work along the same lines has been previously noted (E. S. R., 40, p. 731).

In the cereal breeding work two winter wheat varieties of particular value and named Minturki and Minhardi have been developed from crosses between Turkey and Odessa. A new promising barley variety named Minsturdi is reported as produced from a cross between South African and Manchuria. A durum wheat named Mindum, which is a good yielder, is described as a selection of the Arnautka group. First generation crosses between high protein self-fertilized strains of Minnesota No. 13 corn gave somewhat better yields and produced 2.5 per cent more protein than was secured from ordinary Minnesota No. 13 corn normally pollinated.

In grain variety trials Mindum, Marquis, and Preston wheat proved of equal value. Lincoln, Silvermine, Victory, Improved Ligowo, O. A. C. 72, and Minota oats gave practically equal yields and outranked other varieties in production. Two crosses between Lion and Manchuria barley gave the highest yield of the varieties tested. Grimm alfalfa sown in 1914 yielded three crops in 1918, while common alfalfa on adjacent plats was entirely killed out. Cooperative production and distribution of seeds of various field crops, including sugar beets, are briefly noted.

The results of studies in the division of horticulture on degeneracy in the potato showed that straw mulch and shading had no material effect on tubers already running out, but gave marked results in maintaining the productiveness and vigor of new stock.

[Report of field crops work at the Crookston substation, Minn., 1918], C. G. Selvig (*Minnesota Sta. Rpt. 1919, pp. 66–68, 70–73*).—Variety, culture, and fertilizer trials with various field crops conducted during the year in continuation of similar work already reported (E. S. R., 40, p. 732) are described. The season of 1918 is noted as one of the most favorable on record.

The leading varieties and their yields per acre were as follows: Mindum wheat, 43.3 bu.; Marquis wheat, 37.8 bu.; Svanhals barley, 57 bu.; Iowa No. 105 oats, 88.6 bu.; Iowa No. 103 oats, 88 bu.; Minnesota No. 2 rye, 33 bu.; Bangolia field peas, 25.5 bu.; Minnesota No. 19 flax, a wilt-resistant variety, 13.5 bu.; Semipalatinsk No. 2445 alfalfa, 6,177 lbs., in two cuttings; Giant Sugar Feeding mangels, 23.8 tons; Prizewinner rutabagas, 500 bu.; and Mastodon stock carrots, 10.6 tons. Brome grass yielded 4,300 lbs. per acre, timothy 2,600 lbs., and sweet clover 2,500 lbs. The highest yield of hay, 4,800 lbs. per acre, was secured from a mixture of brome grass 10 lbs., tall meadow oat grass 6 lbs., white clover 2 lbs., and alfalfa 4 lbs. per acre.

In 1918 under favorable seasonal conditions oats sown at the rate of 8 pk. per acre gave the best yield, while for the 6-year period the use of 13 pk. per acre has given the highest average yield. Sowing on plowed land, corn stubble, or on corn land, with part or all of the stalks standing did not give sufficient protection to winter wheat to make its culture profitable. In the different crop-rotation tests in progress, wheat produced 24.7 bu. per acre in the 7-year rotation, 19.8 in the 5-year rotation, 18.4 in the 4-year rotation, 19.1 in the 3-year rotation, 17.2 in continuous cropping with clover, and 17.4 bu. in continuous cropping. Oats yielded 42 bu. in the 7-year rotation and 55.7 bu. in the 5-year rotation. Barley yielded 16.8 bu. in the 7-year rotation and 30.6 in the 3-year rotation.

Wheat showed a much more marked benefit from acid phosphate in 1918 than it did in earlier years. Barnyard manure when used alone gave as high yields as when reinforced by acid phosphate or rock phosphate.. In general the increase in yields from acid phosphate has not been sufficient to make its use clearly profitable on the soil under test.

In variety tests with potatoes Green Mountain and its seedling, the Kremer seedling, gave the best yields of the late varieties, yielding 126 and 128.6 bu. per acre, respectively, while Early Ohio produced 128.6 bu. per acre. In an 8-year test the standard varieties produced the following average yields: Green Mountain 128.56, Rural New Yorker 119.23, Early Ohio 113.78, Irish Cobbler 106.48, Burbank 94.7, and Triumph 79.04 bu. per acre. Seed tubers of Early Ohio grown at the four substations in 1917 were compared at Crookston in 1918. The highest yield, 239.4 bu. per acre, was secured from the seed grown at Crookston, while the seed from Duluth gave 236.48, that from Grand Rapids 156.75, and that grown at University Farm 129.24 bu. per acre. Green Mountain grown in ten check rows gave an average yield of 234.1 bu. per acre.

The experiment with different-sized seed pieces this year resulted in the highest yield, 207.7 bu. per acre, from 4-oz. tubers when cut in half. In comparing different quantities of seed per acre the highest net yields were obtained from 16, 18, and 20 bu., the respective yields being 150, 155, and 154.5 bu. per acre. Sixteen bu. per acre gave the highest net yields through the 4-year period. Commercial fertilizers on potatoes in a 3-year rotation showed no marked increase in yield in 5 years. Potato seed selection experiments with Early Ohio resulted in yields of 128.6 bu. from hill-selected seed, 104.1 bu. from bin-selected, 65 bu. from field-run, and 58.3 bu. per acre from run-out seed. The results of growing potatoes in rotation showed that the largest yields were produced in the short-term rotations. It was noted that tuber diseases were more common in the second crop in a 3-year rotation than on new or clean soil.

[Report of field crops work at the Crookston substation, Minn., 1917–18], C. G. SELVIG (*Minnesota Sta., Rpt. Crookston Substa., 1917–18, pp. 16–47, 48–51, 57–65, 93–97, figs. 12*).—This work, which is in continuation of previously reported activities of the same nature, has been noted above or previously (E. S. R., 40, p. 732).

[Report of field crops work at the Duluth substation, Minn., 1918], M. J. THOMPSON (*Minnesota Sta. Rpt. 1919, pp. 87, 88, 89*).—The climatic conditions of the season and the results of culture and variety tests are briefly noted.

Six-rowed varieties of barley, Minnesota No. 281 oats, and Alaska peas maintained their lead in the test. Millets did not set seed, but the following yields of forage per acre were secured: Japanese 3.6 tons, German 3.8 tons, Siberian 4.2 tons, Hungarian 4.3 tons, and Proso 4.7 tons. Sunflowers grown for silage produced 13.56 tons of green feed per acre. Among eight standard varieties of potatoes Burbank Russet ranked first with 199.5 bu. per acre, followed by King with 198.5 bu., and Burbank with 198 bu. Early Ohio potatoes from northern-grown seed tubers as a rule gave the better yields and the more uniform tubers. Twelve seedlings, averaging more than 200 bu. per acre at University Farm in 1917, showed a distinct decrease at this station in 1918. An average gain of 29 bu. per acre was secured from spraying.

In the fertilizer trials potatoes on unlimed soil produced 10 bu. more per acre than were secured from those grown on limed soil. The average yield per acre on acid phosphate plats was 191 bu., on rock phosphate plats 196 bu., on manure plats 202 bu., as compared with 169 bu. on the check plats. In a fertilizer test with oats the highest yield, 63.09 bu. per acre, was obtained on the acid phosphate plat, while the rock phosphate plat yielded 56.22 bu., the manure plat 59.79 bu., and the check plats 49.38 bu. Lime increased the yield of hay on all plats nearly 18 per cent. This year plats on which clover was plowed under yielded 156.7 bu. of potatoes as compared with 134.9 bu. on plats that had been pastured and 106.1 bu. on plats that had been harvested. In an experiment in which duplicate plats in 3-year rotation received 5, 10, and 20 tons of manure per acre, respectively, the 5-ton rate yielded an average of 133 bu. of potatoes, the 10-ton rate 145 bu., and the 20-ton rate 139 bu. per acre, while for oats the respective yields were 30.7, 33.1, and 36.5 bu. per acre.

[Report of field crops work at the Grand Rapids substation, Minn., 1918], O. I. Bergh (*Minnesota Sta. Rpt. 1919, pp. 83–85*).—A brief description is given of climatic conditions for the year ended June 30, 1919, and of the progress of work along lines similar to those previously noted (E. S. R., 40, p. 734).

Maximum yields per acre in variety tests with field crops are reported as follows: Red Chaff, fife wheat, 38.35 bu.; Prelude, an early bearded fife, 35.8 bu.; Marquis 35.4 bu.; Minnesota No. 951, a durum wheat, 47.5 bu.; Odessa, 6-rowed barley, 52.8 bu.; Austrian Hannah, 2-rowed barley, 55.7 bu.; Silvermine No. 506 oats 130.3 bu.; emmer 54.4 bu.; winter rye 44 bu.; Turkey Red winter wheat 24.9 bu.; Burbank potato 415.3 bu.; and Minnesota Grimm alfalfa 4,660 lbs. Different meadows of timothy and clover ranged in yield from 2,280 to 3,550 lbs. of hay per acre, while broom corn gave 1,320 lbs.; English rye grass 1,280 lbs.; meadow fescue 1,280 lbs.; western rye grass 1,160 lbs.; and orchard grass 760 lbs. per acre. A yield of 6,800 lbs. of hay per acre was secured from oats and peas.

Grimm alfalfa seeded at the rate of 3 to 4 pk. per acre early in April with wheat as a nurse crop, and the soil manured and inoculated, gave a very successful stand. Minnesota No. 2 winter rye and Turkey Red winter wheat gave the best yields from seedings made on August 15 as compared with those made on later dates. Winter rye cut for hay June 17 yielded 2.6 tons per acre. Improvement work with Minnesota No. 13 Yellow Dent corn was continued, and the development of a strain somewhat smaller than the ordinary Minnesota No. 13, but of earlier maturity, is reported.

The results of experiments on muskeg soil indicated that upland soil requires manure and lime and that rye for grain, timothy and clover, oats and peas for hay, Kentucky blue grass, redtop, timothy, and clover for pasture, Russian sunflower for silage, rutabagas for forage purposes, and rape for soiling and pasture may be grown successfully with this treatment. The use of peat on unlimed soils showed a beneficial effect on all crops of the rotation, but much less so than stable manure.

[Report of field crops work at the Morris substation, Minn., 1918], P. E. Miller (*Minnesota Sta. Rpt. 1919, pp. 74–81*).—This work has been noted from another source (E. S. R., 42, p. 731).

[Experiments with field crops at the New Jersey Station], J. G. Lipman and A. W. Blair (*New Jersey Stas. Rpt. 1918, pp. 184–193*).—These experiments were largely in continuation of work previously noted (E. S. R., 41, p. 35). The fifth year's yield from the first cutting on four alfalfa plats was largest on the plat which had received 4,000 lbs. of ground limestone per acre, and lowest on the plat receiving no limestone. In average yield for the 5 years these plats stood in the same relationship.

Experiments to study the influence of bacteria carried in manure on the decomposition of leguminous and nonleguminous green manures are described. Cow manure at the rates of 50, 100, and 200 lbs. per $\frac{1}{40}$ acre plat was spread before a green manure crop of vetch and crimson clover or of rye was plowed under. A study of the corn grown after this treatment showed that the total nitrogen recovered in the crop from the manure plats exceeded the total nitrogen recovered on the check plats. It did not appear that the increase could be attributed entirely to the manure, and it is believed that the organisms introduced in the manure furthered the decomposition of the green manure material and thus provided more nitrogen for the following crop than was furnished where no manure was given. The average yield of corn where the leguminous crops were plowed under was 2,300 lbs., and where rye was used as a green manure 1,760 lbs. per acre. The corresponding average quantities of nitrogen recovered were 54.5 lbs. and 41.3 lbs., respectively.

A study of the influence of lime on the yield of dry matter and nitrogen from different varieties of soy beans has been previously described (E. S. R., 34, p. 632). In 1917, a study made of the influence of lime on the number of nodules and the percentage of nitrogen when soy beans are harvested for hay showed that the average yield of dry matter from 12 plants from the limed plats was 84.4 gm. and from the unlimed plats 46.5 gm. The percentage of nitrogen in the dry matter was 0.25 per cent higher for the limed than for the unlimed plats. On the limed plats an average of 85 nodules, and on the unlimed plats of 37 nodules per plant, was found. Of six varieties grown to maturity on both series of plats all gave the higher yield of beans and straw on the limed plats, the average increase being 5.5 bu. of beans and 800 lbs. of straw per acre. Of the varieties grown Austin stood first in yield with 20 bu. per acre. The percentage of nitrogen in different varieties grown from 1914 to 1917, inclusive, is shown in a table.

[Report of work by the department of agronomy of the New Jersey Stations], F. App (*New Jersey Stas. Rpt. 1918, pp. 171–173*).—The activities of the department for the year are briefly stated and results from alfalfa and sweet clover seedings are noted. Alfalfa seeded in August without a nurse crop and during the latter part of March with wheat as a nurse crop produced good stands, while alfalfa seeded April 11 and June 7 without a nurse crop was a failure. Observations made at the station and over the State brought out the fact that a successful stand of alfalfa depends largely upon the proper source of seed.

Sweet clover seeded with wheat as a nurse crop in 1916 gave a very rank growth in 1917, when it was allowed to go to seed to reseed itself. Reseeding by this method, however, was not successful, although in practice it is frequently accomplished in this way.

[Report of the] department of agronomy, A. N. Hume (*South Dakota Sta. Rpt. 1919, pp. 6–11*).—The progress and status of work on the influence of rotation upon the maintenance of soil fertility, correlations between certain physical characters of plants and their capacity for yield, and water as a limiting factor in the growth of sweet clover are briefly described, and variety, culture, breeding, and fertilizer experiments with cereals are noted. Some of the work with cereals referred to has been reported in bulletin form (E. S. R., 39, p. 739; 40, p. 34).

New [field crop] plant introductions, N. E. Hansen (*South Dakota Sta. Rpt. 1919, pp. 29–33*).—Plant introductions, including durum wheat, alfalfa, proso, sweet clover, and Chee grass (*Lasogrostis splendens*), made by the author a number of years ago from Russia and Siberia, are enumerated and the more important species and varieties are described, mainly as to their cold and drought resistant characters. It is pointed out how new strains have been developed from the original material and what progress has been made in testing and distributing varieties of value under South Dakota conditions. A hybrid alfalfa known as Cossack and marked by a very light-colored variegation, including many white flowers, is reported as successfully grown on an extensive scale in the western part of the State. A selection from Cossack alfalfa made to develop a white-flowered variety came about 70 per cent true to white color two years ago, and was about 97 per cent white during the past season. Semipalatinsk alfalfa, it is stated, has proved thoroughly hardy in Saskatchewan.

Selection work with Hansen White Siberian proso was conducted to develop a pure line and a select variety, and efforts were put forth to establish the use of proso as a new cereal for table use. Hansen White Siberian sweet clover and Chee grass are reported as giving good results as far North as Saskatoon, Sask. Chee grass is described as growing up to 16 ft. or more in height on pure alkali soils on the dry steppes of the Semipalatinsk Province of western Siberia.

Report of experiments at substation No. 12, Chillicothe, Texas, R. W. Edwards (*Texas Sta. Bul. 253 (1919), pp. 5–8, 10–28, figs. 11*).—Brief descriptions are given of 17 varieties of grain sorghums and 10 varieties of forage sorghums tested at the station. The average grain yields of 10 varieties grown for the 5 years, 1913–1917, ranged from 11 bu. per acre for Dwarf Kafir to 23.3 bu. for feterita. Dwarf hegari and Dwarf milo gave an average yield per acre of 21.2 and 21.8 bu. per acre, respectively. In average forage yields for the same years Orange and Sumac of the forage sorghums ranked first with 8,580 lbs. and 8,040 lbs. per acre, respectively. Blackhull Kafir, a grain sorghum, in this test ranked next in average yield per acre with 5,040 lbs. In experiments on the rate of planting sorghums in rows the best yields in general were secured from the thickest plantings. In the average of 4 years' results of experiments on the rate of seeding forage sorghums in close drills or broadcast, the best yields were obtained from the use of 45 lbs. of seed per acre sown in close drills. A test of different dates of seeding resulted in the best yields of forage from seedings made June 2 and 15. Other results indicated that the highest grain yields are secured when seedings are made from 2 to 4 weeks earlier.

Sudan grass gave much better yields of seed and hay when grown in rows 40 in. apart than were secured from rows 24 in. apart or from close drills. The results of seeding Sudan grass at rates varying from 10 to 35 lbs. of seed per acre indicated that from 15 to 20 lbs. of seed is likely to give the best results. Soy beans did not prove a satisfactory crop at the station, but cowpeas proved the most successful annual leguminous crop grown. The varieties found most valuable are briefly described. Brief notes are also given on Kulthi beans, moth beans, and mung beans.

Previous work was summarized in Bulletin 202 (E. S. R., 37, p. 331).

The genera of grasses of the United States, with special reference to the economic species, A. S. Hitchcock (*U. S. Dept. Agr. Bul. 772 (1920), pp. 307, pls. 20, figs. 174*).—This bulletin describes all the genera of grasses which include species native, introduced, or cultivated in the United States. Under each genus the useful and the harmful species are pointed out. Descriptions are given of the subfamilies and keys to the tribes, of the tribes and keys to the genera, and of the genera as grouped under 14 tribes.

Silage crops, E. B. Stookey (*Washington Sta., West Wash. Sta. Mo. Bul., 7 (1920), No. 12, pp. 198, 199*).—Brief notes are given on the culture of corn, clover, and grass, spring oats and peas or vetch, and sunflowers for silage. Minnesota No. 13 corn planted in hills 18 in. apart or drilled 8 or 9 in. apart with a distance of 3 ft. between the rows gave generally the best results. Of the different cereals grown with peas or vetch oats proved most satisfactory. The use per acre of 60 to 90 lbs. of oats with 40 to 50 lbs. of spring vetch or 60 to 90 lbs. of White Canadian or McAdoo field peas is recommended. Mammoth Russian sunflowers planted at the distances given for corn produced a much heavier crop, especially on light soil, than was secured with corn, but the silage produced was distinctly inferior to corn silage.

Alsike more reliable than the red clover (*Mo. Bul. Ohio Sta.*, *4* (*1919*), *No. 12*, *p. 368*).—Alsike clover is reported as being substituted increasingly in Ohio for common red clover, especially on soils deficient in lime and drainage. The resistance of alsike clover to anthracnose and root rot diseases, the cheaper seed, and the smaller quantity required of it, are pointed out as favorable factors in this connection.

Cotton growing, R. L. Stewart (*New Mexico Sta. Bul. 120* (*1919*), *pp. 16*, *figs. 5*).—Experiments in cotton growing conducted in 1891 are briefly reviewed, and the results of experiments carried on from 1916–1919, inclusive, are reported.

In 1916 the best stand was secured from plantings made April 21 and 24. A planting made June 18 resulted in a good stand, but the larger part of the bolls produced did not mature before frost. Of 8 varieties tested Burnett, the leading variety, produced 1.47 bales per acre, being followed by Durango with 1.46 bales, and Allen Improved Triumph with 1.37 bales. In 1917 two mesa plats about 40 ft. higher than the valley were planted to Durango cotton on May 28. The first picking was made October 1, and although a large number of bolls did not mature before frost a yield of 0.82 bale of lint cotton per acre was secured.

A piece of valley land containing 1.3 acres, planted to cotton April 22, 1918, yielded at the rate of 1.35 bales of lint per acre. The first picking was made September 28, the second October 18, and the third and last November 19. Several plats of cotton grown on mesa soil in 1918 gave an average yield of 1.25 bales per acre, the leading plat yielding at the rate of 1.9 bales. The work of 1918 was repeated in 1919 on the same piece of ground and with the same kind of treatment. The cotton was planted April 23, chopped June 4, given two other hoeings, together with two cultivations, and was irrigated 5 times. The entire field yielded at the rate of 1.25 bales per acre. This year 8 plats of the same variety planted on the mesa land gave an average yield per acre for the entire area of 0.7 bale.

The use of manure, sulphur, lime, acid phosphate, and cottonseed meal, each applied alone in the two years, 1918 and 1919, did not show any marked increases in yield due to the fertilizer treatment. Cotton on alkali land with the water table within a short distance of the surface produced plants of good size and gave a fairly good yield.

A note is given on the value of Durango cotton for the irrigated valleys of southern New Mexico.

Fertilizers profitable for potato growing (*Mo. Bul. Ohio Sta.*, *4* (*1919*), *No. 12*, *p. 368*).—Experiments at the station are noted as showing that from 10 to 16 tons of manure, and from 300 to 500 lbs. of acid phosphate per acre may be used with profit in fertilizing potatoes. The 24-year average yield of potatoes, grown in rotation with wheat and clover and fertilized with 8 tons of manure alone, was 173 bu. per acre.

Prussic acid in sorghum, S. E. Collison (*Florida Sta. Bul. 155* (*1919*), *pp. 51–54*).—This bulletin discusses the economic importance of prussic acid in sorghum, reviews some of the experiments by other investigators with reference to the poisoning properties when sorghum containing the substance is eaten by stock, and reports the results of an examination of 17 varieties of sorghum and related plants for the purpose of determining their prussic acid content. A table is given showing the moisture and dry matter content of the plants, together with the percentage of prussic acid found in the fresh material. The plants were examined when they varied from 12 to 24 in. in height, and the amount of prussic acid found ranged from 0.0007 per cent in Orange sorghum up to 0.0037 per cent in Dwarf hegari. Samples of mature Dwarf hegari contained 0.0038 per cent and similar samples of feterita 0.0036 per cent.

Spring wheat uncertain.—Fly may injure crop (*Mo. Bul. Ohio Sta., 5 (1920), No. 1, p. 25*).—In culture experiments at the station spring wheat gave an average of 18 bu. per acre for 6 years, while winter wheat averaged 34 bu. per acre over a period of 25 years. On account of a heavy infestation of Hessian fly throughout the State spring wheat is considered one of the more doubtful crops for the year.

Clipping tests of oats and wheat, C. G. Williams (*Mo. Bul. Ohio Sta., 5 (1920), No. 1, pp. 20–23*).—Clipping tests of oats made in 1906–7, and of wheat made in 1907 and 1919, are described, and the effect of the treatment is indicated in tables setting forth the yields of the clipped and unclipped crops. The results in some instances showed a marked reduction in yield due to clipping, while in others they indicated apparently a somewhat beneficial effect with reference to yield and the prevention of lodging. The data are considered insufficient to warrant recommending the practice.

Report of the department of seed analysis, J. P. Helyar (*New Jersey Stas. Rpt. 1918, pp. 93–96*).—Summaries of tests of field crop and vegetable seeds made during the year are given in tabular form, with notes on the seed situation of the year and the inspection and analysis of official samples.

HORTICULTURE.

[Recent results of horticultural investigations] (*California Sta. Rpt. 1919, pp. 11–13, 16, 24–31, 32, 38–40, 41*).—A summary is given of horticultural research during the 3 years ended June 30, 1919.

The fertilizer experiments with citrus fruits begun in 1907 have been continued by H. J. Webber and his associates at the Citrus substation. Uniform treatments have now been under way 12 years. The results thus far secured continue to emphasize the great importance of organic matter and nitrogen and the comparative slight importance, on the soils included at least, of phosphoric acid and potash. The plats treated with stable manure and raw rock phosphate on which a leguminous winter cover crop is each year grown and plowed under in early spring continue to be superior to those otherwise treated. Plats treated with chemicals, such as nitrate of soda alone or in conjunction with sulphate of potash, superphosphate, and dried blood have gradually deteriorated, showing increased quantities of mottle leaf, and are now much inferior to plats that have received organic matter. In an experiment conducted to determine the best methods of rejuvenating an old citrus grove the trees on two plats receiving manure and summer cover crops seemed to have improved more in general appearance than the trees on any other plat, although other methods of treatment here noted resulted in larger yields of fruit.

Further studies on the use of green manures in citrus groves continue to emphasize the importance of this practice, bitter clover (*Melilotus indica*) and purple vetch (*Vicia atropurpurea*) giving the most satisfactory results when used as winter cover crops. Preliminary trials of another vetch, *V. dasycarpa*, have also given excellent results. The purple vetch is proving very desirable for use, especially on light sandy soils where in some cases it has been found difficult to get a good stand of bitter clover. A feature that has been brought out in the recent experiments is the importance of using green manures in young groves to improve the soils while the grove is developing. In a 70-acre grove planted at the Citrus substation in the spring of 1917, Blackeye beans have been grown between the trees each summer and bitter clover sowed broadcast over the entire area in the winter. The beans have more than paid for the cultivation of the grove, and the bean straw and clover has been returned to the land. Under this treatment the grove has made a remarkable growth with no other fertilizer.

Recent developments in citrus stock experiments have been noted from another source (E. S. R., 42, p. 537).

The value of severe pruning as a means of rejuvenating nonproductive orange trees has been investigated by H. S. Reed with the result that moderate pruning has been found to be fully as beneficial as severe pruning and to give much larger yields of fruit. Reed and F. F. Halma have found strong evidence for the presence of a factor which controls the branching habit in the lemon, pear, and other trees. The apical portion of the shoot appears to produce a substance which travels downward in the phloem layer and prevents the development of subapical buds. If the apical portion of a young shoot be cut off the lateral buds just below the point of amputation will grow out to form shoots, because they are thereby freed from the inhibiting substance. When they begin to grow, however, they form a renewed supply of the inhibiting substance and perpetuate a dormant condition in the buds below them. When an unbranched shoot is held in the horizontal position the buds on the upper side of the shoot develop but the lower buds do not, the inhibiting substance appearing to flow along the ventral side of the shoot. Observations made by Reed on the fruit growth of Lisbon lemons show that the fruit requires 7 to 14 months to come to maturity. Fruit which was set in May, June, and July came soonest to maturity. Fruit set in the spring months has the best chance of survival. As the season advances the chances for advancement of juvenile fruit diminishes.

Cold-storage work conducted by I. J. Condit with several varieties of persimmons shows that the fruit can be kept satisfactorily for several months, although market demands probably do not justify storage much after January 15. Avocados of the Mexican type kept fairly well for about one month, after which shriveling and decay ensued. Freezing at 30° F. darkens the flesh of the avocado and renders it unfit for eating, whereas persimmon flesh is not injured at this temperature. Fuerte avocados held at 32° temperature were found to lose their normal green appearance and to assume a brown, dirty color. On the other hand, fruit of the Challenge held for 6 weeks at 32° kept its firmness and appearance remarkably well. Both persimmons and avocados soften much more rapidly at 36° than at 32° or 30°.

Studies on caprification of figs conducted by Condit show that the number of female Blastophagas entering a Smyrna fig in the process of caprification depends largely upon the numbers of Capri figs and insects in the tree. A great majority of the insects issue from the mature Capri figs during the first day after distribution, very few after the third day. The female Blastophagas hover closely around the Capri or Smyrna tree, and are found at distances away from the tree only when carried by wind. Caprification exercises marked changes in the color and appearance of certain figs, such as the Brown Turkey and particularly the Kadota. Caprified Adriatic figs show more interior than exterior differences. Generally speaking, caprification increases the number of seeds and sugar content of the figs.

Several fruit pollination studies are briefly noted. Continued studies by G. L. Philp have confirmed previous observations by Tufts (E. S. R., 41, p. 148) that all almond varieties are self-sterile and a few are inter-sterile. The apricot, on the other hand, appears to be sufficiently self-fertile to make inter-planting for purposes of cross-pollination unnecessary. Further studies with cherries confirm previous results that the leading varieties of sweet cherries are self-sterile under California conditions. Several of these varieties have also proved inter-sterile. Results of pollen studies with Bartlett pears have been noted in Bulletin 307 of the station (E. S. R., 41, p. 240). During the season of 1919 13 varieties of pears, including the Bartlett, were tested for self-sterility. All varieties tested were benefited by cross-pollination. Observations made by A. H. Hendrickson relative to the pollen of plums and prunes covering a period of 5 years indicate, as noted in a previous report (E. S. R., 36, p. 139), that practically all the Japanese plums are self-sterile but will cross-pollinate readily when the blooming periods occur approximately at the same period. The same is generally true for European plums. The French (Agen) and Sugar prunes are undoubtedly self-fertile.

Pollination work with Yellow Newtown and Yellow Bellflower apples was conducted by E. L. Oberholser in 1919. The results indicate that the Yellow Newtown is sufficiently self-fertile to set a fair crop of fruit through the agency of its own pollen, but that its fruitfulness is greatly increased when pollinated with Yellow Bellflower. Yellow Bellflower is not sufficiently self-fertile to set paying crops of fruit without cross-pollination, and did not set a full crop when pollinated with Yellow Newtown. The apples were found to set fruit much more abundantly where hives of honeybees were placed in the orchard to supplement natural pollinating agencies.

M. N. Wood studied the causes of self-sterility in certain fruit, particularly the almond. A well-known self-sterile variety of almond, the Ne Plus Ultra, was made to set 30 per cent of fruit from its own pollen by previously applying to the pistils a 3 per cent sugar solution. This set of fruit is as good or better than the number set by this variety under first-class conditions for cross-pollination.

The results of pruning investigations of deciduous trees conducted by Tufts indicate, in general, that light and thin pruning is superior to heavy pruning and thinning. The results in detail secured with young trees are given (E. S. R., 42, p. 534).

Experiments conducted by R. H. Taylor indicate that the optimum temperature for the most rapid ripening of Bartlett pears is between 70 and 80°. The ripening process of pears at higher temperatures was delayed in a similar way but to a less degree than when pears were held at a temperature of 32°. Pears of the same lot which ripened fully in one week when held at a temperature of 70 to 80° kept well for a period of from 4 to 6 weeks when held in a temperature of from 100 to 110°. These results suggest that during an abnormally warm season the pears should not be picked early as has been the custom, but should be allowed to remain on the trees, thereby securing better development of the fruit with the moderation of temperature later on. It also suggests the possibility of holding pears in a warm room rather than making an effort to store them in slightly cooler temperatures. Different varieties of pears differ considerably in the stage of maturity at which they should be picked for market. The Bartlett was found to be greatly improved in quality if picked in the earlier stages of its maturity, whereas the Bosc has failed to reach good quality when ripened in storage unless it reached a higher stage of maturity on the tree than required for the Bartlett.

Tests were made to determine whether dried fruits are in danger of being injured by freezing under conditions of usual shipment to eastern markets. Commercially processed and packed fruits containing approximately 22 per cent of moisture were not frozen or injured when subjected to a temperature of —25°. The results of a survey of fruit drying practices in the State made by W. L. Sweet are noted on page 804.

Various materials have been tested for covering pruning wounds on fruit trees. Cement paint seemed to stick longer and tighter than any other material, but was the most expensive paint tried. Hard asphaltum proved quite satisfactory in its sticking qualities, but was troublesome to apply as it had to be painted on while warm. A roofing paint called Oronite served all purposes and was easy of application.

A test of root stocks for some of the common deciduous fruits was started in 1915. After 4 years, Royal Ann cherries on Mazzard and Mahaleb stocks have made about the same growth. Bartlett pear on quince root has made very poor growth, while adjacent trees on French pear stock have made very satisfactory growth. Bartlett on Japanese pear root has done well for two years and promises to be highly satisfactory. Bartlett top-worked on Surprise pear, which in turn was grafted on Japanese pear root for the past two years, has made good unions. Prunes on almond and myrobalan stock so far have shown no differences in growth. Peaches and almonds on the different root stocks mentioned for stone fruits have shown no special differences in growth.

Studies made to determine uses for wine grapes have been elsewhere reported (E. S. R., 42, p. 537). Observations on the Black Corinth or true currant grape indicated that it must be grafted on resistant stocks. The best stock at the Davis farm has been *Riparia gloire*, on which it has yielded 1.75 tons of dried fruit per acre. At the Kearney vineyard the best stock has been Chasselas×Berlandieri 41–B, on which it has yielded about 2 tons. Increase of bearing by girdling is being tested and has given very promising results. Among the promising table grapes under observation during the last three years are the Kurtelaska, a grape of Malaga type, and the Marvel of Malaga, a grape somewhat resembling the Tokay, which is believed to be specially promising for districts and soils where the Tokay fails to color well. A large amount of data has been accumulated by F. T. Bioletti and his associates on the complex question of the relative phylloxera-resistant value of various grape stocks. On the basis of the results at Davis and Kearney recommendations are given regarding suitable stocks for the principal varieties of table, raisin, and wine grapes. One of the remarkable results of the work is the indication that the Rupestris St. George, which is used almost exclusively in California, is inferior in value to nearly all of the other stocks tested.

Observations and experiments conducted by Bioletti and F. C. H. Flossfeder indicate that the pruning of young olive trees should be limited to the minimum necessary to give them the proper form of framework, and that the pruning of old trees should be limited to the annual thinning out of young branches and twigs. In all cases thinning out is emphasized rather than cutting back.

[Report of the] division of horticulture, W. G. Brierley (*Minnesota Sta. Rpt. 1919, pp. 49–54*).—Brief statements are given of progress made in various lines of work.

Studies relative to the healing of pruning wounds on apple trees have shown that 6.3 per cent of all wounds from 0.25 in. to 4 in. in diameter fail to heal, and that the failures are practically all due to poorly made wounds. It is concluded that if the tree is kept growing vigorously and the wounds are carefully made, sterilized, and covered with grafting wax or gas tar to hinder the entrance of disease, there should be few wound failures.

Blueberry experiments are being conducted at Cloquet in cooperation with the Bureau of Plant Industry of the U. S. Department of Agriculture. The results already secured with plants of *Vaccinium pennsylvanicum* indicate that this low-bush type can be readily propagated and grown, and the station is to test several hundred high-bush×low-bush hybrids received from the U. S. Department of Agriculture. Young plantings of black walnut, chestnut, shagbark hickory, and filbert were not injured in the comparatively mild winter of 1918–19, but pecan and English walnut trees showed a high percentage of winterkilling.

Work in fruit breeding was continued and extended. The results thus far secured in the sterility study with plums have been recently noted (E. S. R., 42, p. 534).

In the breeding work with vegetables, improved strains of the Alaska pea, Refugee bean, and Hubbard squash have been isolated. The crossing and selection of cucumbers and tomatoes was also continued. Work with potatoes is noted on page 825.

Progress made in variety tests of fruits, cooperative orchard management, and in landscape gardening and floriculture is briefly reported.

[Report on horticultural investigations at the Crookston Substation, 1917 and 1918], C. G. Selvig (*Minnesota Sta., Rpt. Crookston Substa., 1917–18, pp. 65–80, figs. 2*).—Data are given on the condition of hardy apples and crab apples planted at the Crookston substation during the period 1910–1918.

The results to date indicate that only the hardiest varieties of apples, such as Hibernal, Duchess, and possibly Pattens Greening and Charlamoff, can be expected to survive any considerable time. Virginia and Transcendent crabs are apparently more hardy than the above named apples. Even these varieties show more or less heart-killing each year, but under favorable cultural conditions may continue their growth for 10 or 15 years and produce a few crops before dying. Observations conducted for three seasons show that trees growing in sweet clover sod were less subject to heart-killing, sun scald, and alkali injury than similar trees growing under clean cultivation. The growth of trees on the sweet clover plat was more mature in the fall. Tree and bush fruits do best when planted in the shelter of effective windbreaks, where they are protected from the drying winds of summer and where the snow cover is abundant in winter.

Forty-two different trees of Minnesota seedling plums have been planted during the last 5 years. Of these, only one tree, Minnesota No. 7, has survived. Standard varieties of plums planted in a similar situation have quite largely failed. On the other hand, both seedlings and standard varieties when planted in or near the windbreak have made good growth and yielded fair to good crops. The varieties of gooseberries and currants under test are apparently very hardy. All of the Minnesota seedling raspberries were severely winterkilled during the winter of 1917–18, most of the standard varieties also showing great injury. The variety which survived the winter best was the Sunbeam. Seedling grapes were also seriously injured, but the Beta variety and plants of what were supposedly Campbell's Early survived the winter as in former years and made a vigorous growth.

A list is given of varieties of fruit recommended for northern Minnesota, based both on the work at the substation and the results obtained by growers in that section.

Tabular data are given showing the number of windbreak and ornamental trees and shrubs planted each year since 1912 and the number now growing, together with a list of desirable windbreak trees and ornamental trees, shrubs, and vines.

The variety testing of vegetables was continued during the year. Data are given and discussed showing the yields for 1918 for different varieties of beans, beets, cabbage, carrots, cauliflower, sweet corn, cucumbers, lettuce, onions, parsnips, peas, radishes, squash, tomatoes, and other vegetables.

[Report on horticultural investigations at the Crookston substation, 1918–19], C. G. SELVIG (*Minnesota Sta. Rpt. 1919, pp. 69, 70*).—The results with apples at the Crookston substation continued to look unpromising for apple culture in that section, but in view of the comparatively favorable condition of trees growing in sweet clover sod as noted above, new plantings of varieties of apples and crab apples of the first degree of hardiness have been made on plats receiving the following cultural treatments: Bare fallow, fallow with fall cover crop, grass, hay to be removed, sod mulch, and sweet clover, with one hay crop and one seed crop each year. Variety tests of garden vegetables are briefly noted.

[Studies on heredity and environment at the New Jersey Station], B. D. HALSTED (*New Jersey Stas. Rpt. 1918, pp. 197–199*).—A brief progress report on heredity and environment studies with vegetables and other plants (E. S. R., 41, p. 42). Among the desirable strains of vegetables resulting from the breeding work to date are a wax-podded pole bean, resulting from a cross between Hodson Wax and Kentucky Wonder, a green-podded pole bean from the same cross, a crystal wax type larger than the crystal parent, a hybrid wax bean, and a "Giant Plum" tomato of commercial size.

Report of the specialist in market gardening, C. H. NISSLEY (*New Jersey Stas. Rpt. 1918, pp. 150–154*).—A report similar to the above on several demonstration projects relating to market gardening conducted by growers in cooperation with the specialist and the county agents.

Report of the specialist in vegetable growing, R. W. DE BAUN (*New Jersey Stas. Rpt. 1918, pp. 145–149*).—A report on extension activities in the State during 1918, with special reference to increasing vegetable production for wartime needs.

Report of the department of horticulture, M. A. BLAKE and C. H. CONNORS (*New Jersey Stas. Rpt. 1918, pp. 41–64, fig. 1*).—The report contains observations on winter injuries to fruit trees during the severe winter of 1917–18, a statement of progress made in peach investigations (E. S. R., 41, p. 41) during 1918, and considerable tabular data showing the blooming dates of apples and pears for 1918 and picking date records in the strawberry variety tests for the years 1911–1918, inclusive, together with the usual weather observations for the year. Observations made on peach borers at Vineland are also noted.

The fertilizer experiment that has been conducted for several years in one of the peach orchards at Vineland has been discontinued, and the results are to appear in bulletin form. The orchard will now be given good general treatment with the view of demonstrating that a peach orchard can be maintained in profitable bearing beyond its tenth year of growth.

Some experiments were started to determine the rate of growth of the fruits of several varieties of peaches as affected by thinning the fruits at different stages. Special measurements were also being made during 1918 to determine the relation between the system of pruning peaches and the growth of twigs and fruit. The seedlings secured from peach crosses made in 1916 were set in orchard form. During the season of 1917 a bud sport was found at Vineland on the peach variety Burke, in which the leaves were variegated, white, and green. It is to be propagated as a horticultural variety.

[Report on orchard trials at the Duluth substation], M. J. Thompson (*Minnesota Sta. Rpt. 1919, p. 88*).—A note on the losses by varieties of apple trees from winterkilling during the winter of 1918–19. The average of all varieties was 13.5 per cent.

[Report of the] fruit-breeding farm, Zumbra Heights, C. Haralson (*Minnesota Sta. Rpt. 1919, pp. 93–95*).—This report, together with the accompanying report of the committee examining the fruit-breeding farm, was noted from another source (E. S. R., 42, p. 637).

[Report on fruit breeding], N. E. Hansen (*South Dakota Sta. Rpt. 1919, pp. 18–29*).—Work in the breeding and selection of hardy and blight-resistant fruits was continued (E. S. R., 41 p. 238). Descriptions are given of the following varieties sent out for trial in the spring of 1919: The Beauty, Olga, Izo, Sugar, Alexis, Cathay, and Red Tip crabs; also three selected American wild crab seedlings, the Giant Wild, Missouri Wild, and Mercer Wild; the Caramel, Sasha, and Chance apples; and the South Dakota Usuri, Tolstoy, Pushkin, and Gogol pears, together with several varieties of apples on Siberian crab roots.

Japan pear seedlings are apparently too tender as stocks for the blight-resistant hybrid pears as they winter-killed during the winter of 1918–19, thereby preventing the distribution of these hybrids. The author is of the opinion that the Siberian pear, *Pyrus ussuriensis*, and the Chinese pear, *P. ovoidea*, will probably be the hardy blight-proof pear stocks for the North.

In the work with grapes, only one of the standard varieties, the Beta, has proved to be hardy without winter protection. Three other seedlings of the same pedigree as the Beta (the Dakota, Monitor, and Suelter) are being tested, and efforts are being made to improve the native grapes. A seedling of the Wilder crossed with pollen of a wild grape from Bismarck, North Dakota, fruited in 1918. While the berry is small, it is remarkable for the improvement in flavor and for the ease with which the fruits separate from the pulp.

The breeding of hardy roses was continued.

Spring spraying program for 1920, A. Frank (*Washington Sta., West. Wash. Sta. Mo. Bul., 7 (1920), No. 12, pp. 204–208*).—A spraying schedule is given for the control of the common diseases and pests of apples, pears, cherries, prunes, plums, and peaches.

Bearing habits of the Delicious apple, C. W. Ellenwood (*Mo. Bul. Ohio Sta., 5 (1920), No. 1, pp. 27, 28*).—Notes are given on the production records of this variety in the station orchards.

As observed at the station, the Delicious is an annual bearer, but alternates with rather heavy and medium light crops. It compares favorably in yield with other commercial varieties, and seems to reach a profitable bearing age about 10 years after planting. The range of picking dates of Delicious for a 10-year period was from October 3 to October 21.

Fertilizers for peach orchards, P. Thayer (*Mo. Bul. Ohio Sta., 4 (1919), No. 12, pp. 380–385*).—The station started a fertilizer test in a peach orchard in 1915. Although the test has run for five seasons, seasonal conditions have been unfavorable, and the trees have borne only one full crop (1915) and one light crop (1916). Taking the partial data secured in this work in connection with the results secured at other stations the author offers some tentative suggestions for fertilizing peaches.

An abundant supply of nitrogen is favorable to the development of strong new shoots, upon which the fruit buds are formed and an abundance of foliage to nourish the fruit crop. In the absence of nitrogen it is doubtful whether applications of phosphoric acid or potash are justifiable. In the presence of a sufficient quantity of nitrogen, the application of phosphoric acid is beneficial, especially on clay soils. Where both nitrogen and phosphoric acid are supplied there is probably some benefit from potash, especially on sandy soils. On clay soils in the absence of nitrogen, potash is of no value and may be injurious.

The Bartlett plum, P. THAYER (*Mo. Bul. Ohio Sta., 5 (1920), No. 1, p. 26, fig. 1*).—An account of the tree and fruit of this variety, which is recommended more for its ornamental features than as a fruit, although the fruit possesses a fair quality.

[Report on cranberry investigations at Whitesbog, N. J.], C. S. BECKWITH (*New Jersey Stas. Rpt. 1918, pp. 222–230*).—As the result of a conference between station officials, interested cranberry growers, and a representative of the U. S. Department of Agriculture, the station's cranberry investigations were replanned in 1918. Broadly stated, the purpose of these investigations is to make a search for the general principles upon which successful cranberry growing depends. During 1918, attention was given to the problems of plant-food, soil acidity, soil water, and insects. The present report reviews previous work with plant foods (E. S. R., 42, p. 441) and for correction of soil acidity (E. S. R., 39, p. 748), and outlines new experiments along these lines. Work to be conducted in the study of soil moisture and in the control of insect enemies is also briefly noted.

Citrus fertilizer experiments, S. E. COLLISON (*Florida Sta. Bul. 154 (1919), pp. 3–48, figs. 11*).—A detailed account is given of experiments started in 1909 to determine the effects of various fertilizers upon the chemical composition of the soil, upon the growth and composition of the trees, and upon the fruit. The effects of lime and other alkaline materials and of various cultural treatments upon the soil and the trees were also studied. The experiment was conducted in a grove of young trees all of the same variety, specially selected with regard to uniformity of size. The grove was divided into 48 plats and an application of 2 lbs. per tree of ammonia 5 per cent, from sulphate of ammonia; phosphoric acid, 6 per cent, from acid phosphate; and potash, 6 per cent, from high-grade sulphate of potash was used as the standard formula. Several variations from this standard were included in the experiment, and nitrogen, phosphoric acid, and potash from different sources were compared. In order to supplement the work with fertilizers in the field, soil tank experiments were begun on the station grounds with the view of determining losses of fertilizing material in the drainage water under different systems of fertilizing and the effects of long-continued use of fertilizers on the soil.

Summing up the results of the field work, sulphate of ammonia, acid phosphate, and high-grade sulphate of potash has given somewhat better results as measured by the increase in growth than any other mixture. Good results were obtained from the use of nitrate of soda as a source of ammonia, from steamed bone and oats as sources of phosphoric acid, and from low-grade sulphate, hardwood ashes and the muriate as sources of potash. Lime and other alkaline materials, notably ground limestone and basic slag, have proved distinctly injurious to growth. This injury consisted, in its mildest form, of a light attack of frenching; in the severest type, of chronic, severe frenching, partial defoliation, and a permanent retarding of growth, resulting in stunted, undersized, and unhealthy trees. See also a previous note by Floyd (E. S. R., 37, p. 656).

In July, 1910, 18 months after the trees had been planted, they exhibited the early stages of the disease known as dieback. The disease continued to gain headway, and a thorough examination was made of the entire grove with the view of determining whether any relation existed between the disease and the fertilizer treatment. No such relation could be established, the disease appearing to be entirely independent of the fertilizers used. Spraying with Bordeaux appeared to be quite effective in controlling the dieback, and from the end of the year 1915 on and until the close of the experiment no further trouble was experienced with the disease.

Following the freeze of February, 1917, a careful examination was made with the view of finding out what effect, if any, the various fertilizer treatments had in making the trees more or less resistant to cold injury. No conclusive evidence could be obtained indicating that any special fertilizer treatment among those used on the better plats was more effective than another in making the trees resistant to frost. Generally speaking, the trees in those plats which were in a weakened and unhealthy condition owing to various causes, such as overfertilization and the effect of alkaline materials, suffered more seriously from the cold. Trees in a good healthy condition not only withstood the frost better, but made a quicker recovery.

Clean cultivation throughout the year was of considerable benefit to young trees, but after a few years leads to a loss of soil organic matter and should not be practiced with trees over 5 or 6 years old.

Data secured in the soil tank experiment showed that nitrogen, both in the organic and inorganic form, is lost in large quantity by leaching. For the period from July 13, 1911, to July 17, 1913, 72.5 per cent of the nitrate of soda applied to the soil leached through the soil, which was about 4 ft. in depth, and was lost in the drainage water. During the same period 41 per cent of the sulphate of ammonia and 38.3 per cent of dried blood were lost. Losses in potash for the first two years were small, but at the end of 4 years about 30 per cent of the potash applied had leached out. The loss of phosphoric acid was extremely small, amounting to only 0.05 of one per cent of the amount applied for the 4-year period. A large proportion of the phosphoric acid applied was retained in the upper 9 in. of soil, and much of the potash in the water-soluble form was also retained by the soil. There was a slight increase in nitrogen in all of the plats excepting the clean culture and the unfertilized ones.

Roses for the home garden, J. L. STAHL (*Washington Sta., West. Wash. Sta. Mo. Bul., 7 (1920), No. 12, pp. 196, 197*).—This comprises concise suggestions on the culture and care of roses, including a list of desirable varieties tested at the western Washington substation.

Beautifying the farmstead, F. L. MULFORD (*U. S. Dept. Agr., Farmers' Bul. 1087 (1920), pp. 65, figs. 66*).—The author discusses the need of beautifying the farmstead, desirability of making plans for improvement in advance, styles of design, location of the buildings, walks and drives, service features, lawns, arrangement of plantings, use of trees, shrubs, vines, and herbaceous plants, and selection of plant material. The text is accompanied by several farmstead plans. A chart is given showing the appropriate color combinations for highly colored flowers.

FORESTRY.

[Report of forestry investigations at the California Station] (*California Sta. Rpt. 1919, pp. 53–56*).—A survey was made by W. Metcalf of eucalyptus groves of various species in California. The average growth measurements obtained are here presented in tabular form. Several trees from central China have proved to be well suited to central California conditions. Among these are *Populus tomentosa*, *P. simonii*, *P. sinensis*, and *Ulmus pumila*, all of which give promise of making excellent windbreak trees; and *Zelkova serrata*, a fine street tree resembling the elms. Experiments with the seed of Bishop pine (*Pinus muricata*) to determine the vitality in seeds of the closed-cone group of pines indicated that seed just matured shows the highest germination percentage and produces the most vigorous trees and most rapid growth. Seed which had remained in the closed cones for from 3 to 15 years showed a remarkable uniformity of vitality and rate of growth.

Damping off in the nursery seed-beds has been effectively prevented by the use of 0.2 fluid ounce of sulphuric acid per square foot of seed-bed. In the case of fall-sown beds of Douglas fir a better stand was obtained where treatment was given one week before sowing. Based on measurements and observations made at the Chico and Santa Monica Forestry Stations lists are given of species suited for windbreak, ornamental, and woodlot plantings in the Sacramento Valley and in southern California. Notes are given on the principal uses of several California species.

[Note on forestry experiments at the Grand Rapids substation, Minn.], O. I. BERGH (*Minnesota Sta. Rpt. 1919, p. 85*).—In tree planting experiments being conducted at the Grand Rapids substation the effect of intertillage on the growth of different kinds of pine trees as compared with no tillage was very marked, trees receiving intertillage having grown more than twice as much as those receiving no tillage.

The administrative report of the Virginia State forester for the calendar years 1918 and 1919, with suggestions for extensions of State forestry work, and recommendations for amendments to the present forestry laws, R. C. JONES (*Va. State Forester Rpt. 1918–19, pp. 62*).—A report of forest activities with a special bearing on the war, forest-fire protection, educational and demonstration work, nursery operations, etc., including recommendations for a future forestry program and new legislation. The forestry laws of Virginia are appended.

Report of the forestry commission for the year ended June 30, 1919, R. DALRYMPLE HAY ET AL. (*Rpt. Forestry Comn. N. S. Wales, 1919, pp. 38, pls. 9*).—A report on operations on the State forests of New South Wales for the year ended June 30, 1919, including also notes on research work with forest products and data on the organization of the State forests, imports and exports of timber, revenues and expenditures, yields in major and minor forest products, etc.

Salient features of a forestry policy for Ohio, E. SECREST (*Mo. Bul. Ohio Sta., 5 (1920), No. 1, pp. 15–19*).—The author briefly considers some of the more essential features of a joint program of State, municipal, and private forestry.

Cooperation between National Forests and adjacent private lands, B. P. KIRKLAND (*Jour. Forestry, 18 (1920), No. 2, pp. 120–130*).—A contribution from the University of Washington, in which the author submits the outline of a program for the immediate introduction of forestry on private lands adjacent to National Forest boundaries.

Private forestry in France, W. B. GREELEY (*Amer. Forestry, 26 (1920), No. 315, pp. 139–143, figs. 2*).—An analysis of private forestry in France, in which consideration is given to the source of private forests, economic conditions favoring private forestry, and the public policy of France toward her private forests.

Great profits from forests in the French Jura, T. S. WOOLSEY, JR. (*Canad. Forestry Jour., 16 (1920), No. 3, pp. 116–118, figs. 2*).—Summarized growth and yield statistics are given for four 100-year-old fir-spruce stands in the Jura that are somewhat comparable to spruce-fir stands of northern New England or southern Canada. These four stands averages 71,000 ft. b. m. per acre as compared with a yield of from 5,000 to 10,000 ft. b. m. per acre for natural balsam fir and spruce in eastern Canada.

Natural regeneration of French forests, T. S. Woolsey, Jr. (*Amer. Forestry, 26 (1920), No. 314, pp. 77–81, figs. 10*).—An account of methods employed in different types of French forests to secure adequate natural regeneration.

Transcaucasian forests, E. C. Mears (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Com. Rpts. No. 75 (1920), pp. 1794–1797*).—A consular report in which information is given relative to the principal forest species in Transcaucasia, location of forests, the forests now in process of exploitation, forest products available, obstacles to early exploitation, and accessibility of the principal forests. A list is also given of unexploited areas.

The tropical acacias of Queensland, J. H. Maiden (*Proc. Roy. Soc. Queensland, 30 (1918), pp. 18–51, pls. 7*).—In this paper the author presents a tentative descriptive list of tropical Queensland species of acacia. A select bibliography of related literature is included.

Note on Hollong timber (Dipterocarpus pilosus), R. S. Pearson ([*Indian*] *Forest Bul. 39 (1919), pp. 8, pl. 1*).—An account of this Indian timber species, with reference to its general distribution; locality and habit; natural reproduction and rate of growth; characteristics of the tree; characteristics, properties, and uses of the timber; method of extraction; and yields and returns.

The identification of mahogany, A. Koehler (*Jour. Forestry, 18 (1920), No. 2, pp. 154–156*).—A contribution from the Forest Service of the U. S. Department of Agriculture, comprising a brief critical review of H. H. Dixon's article on Mahogany, and the Recognition of Some of the Different Kinds by Their Microscopic Characteristics (E. S. R., 41, p. 541).

[Experiments in rubber culture] (*Fiji Dept. Agr. Ann. Rpt. 1918, pp. 3, 4*).—Data are given showing the average annual increase in girth for several years of the trees in five Hevea rubber plats, together with brief notes on other rubber plants and some tapping experiments.

The use of wood.—Wood in agricultural implements, H. Maxwell (*Amer. Forestry, 26 (1920), No. 315, pp. 148–155, figs. 14*).—This article deals with the uses of wood in the production of various agricultural implements.

Raw material for the paper industry, A. F. Hawes (*Amer. Forestry, 26 (1920), No. 315, pp. 134–138, figs. 5*).—A description of the several processes for making wood pulp, together with a statistical survey of the present production and consumption of pulpwood and suggestions relative to means of perpetuating the national pulp supplies.

Some information about Chinese wood oil, D. Y. Lin (*Far East. Rev., 15 (1919), No. 9, pp. 598–601, figs. 4*).—In this article the author briefly considers the distribution of the wood oil trees (***Aleurites montana*** and ***A. fordii***), the method of cultivation, the oil extraction process, the composition and properties of the oil, the uses of wood oil, the regions of production, the extent of the industry, and the foreign consumption of wood oil. In conclusion, he presents some brief suggestions relative to the cultivation, manufacture, and marketing of wood oil.

The Burmese atha system of measuring timber, A. W. Moodie (*Indian Forester, 46 (1920), No. 3, pp. 132–140, figs. 2*).—A native system of measuring timber used uniformly throughout Upper Burma is described.

Rating scale for foresters, C. M. Stevens (*Jour. Forestry, 18 (1920), No. 2, pp. 143–150*).—The author here presents and discusses the application of a rating scale, which in its present stage of development covers broad basic administrative positions in the Forest Service of the U. S. Department of Agriculture, such as forest ranger and forest supervisor.

DISEASES OF PLANTS.

The biochemistry of resistance to disease in plants, R. A. Gortner (*Minnesota Sta. Rpt. 1919, pp. 34, 35*).—A brief report is given of investigations on the resistance of diseases in plants, the chemical composition of plums resistant and nonresistant to the brown rot organism being studied. In addition, culture experiments with the brown rot fungus (*Sclerotinia cinerea*) were made on prune and apple juice media, and the experiments have shown an active pectase is elaborated by the hyphæ which causes the coagulation of soluble pectins into calcium pectate. If sufficient pectin is present, a fairly firm gel is produced upon which the fungus develops. It is claimed that when the fungus penetrates a host tissue, it dissolves out the middle lamella, but instead of assimilating it for food, the material is precipitated into a compound of calcium pectate. This fills the intercellular spaces, and by preventing the collapse of the tissue, the infected fruit remains firm and retains its form. Through the presence of the calcium pectate in the dried mummies on the trees, water is imbibed freely, and this provides the dormant mycelium with a source of moisture that permits growth and formation of spores during the blossoming time of the trees.

Considerable culture work was done with this fungus to determine its fundamental nutrition, but all attempts to compound a synthetic medium that would support it have failed. It is believed that the juice of the host plant is necessary for the development of the fungus, and this suggests the existence of some accessory food substance which is present in natural hosts.

Malignancy of the crown gall and its analogy to animal cancer, I. Levin and M. Levine (*Proc. Soc. Expt. Biol. and Med., 16 (1918), No. 2, pp. 21, 22*).—The object of this investigation was to repeat from a different standpoint some of the various studies reported by Smith (E. S. R., 38, p. 752). The authors inoculated plants in considerable number and variety with *Bacterium tumefaciens* and made a gross and microscopical study of the resulting crown galls.

Analysis of the material showed that a certain number of these plant tumors behave morphologically and biologically as do benign growths (growing very slowly and interfering not at all with the development of the inoculated plant, and while compressing, not injuring, the neighboring normal tissues); but that other crown galls appear to be true malignant tumors, dwarfing the inoculated plant and inducing the necrosis above and even below the point of inoculation on the stem. Microscopically, the galls show invasion and destruction of the neighboring normal tissues.

A number of crown galls were obtained containing leafy shoots. Close study revealed characters differing materially from conditions obtaining in animal cancer. In most specimens the gall presents throughout only small, young, undifferentiated cells, but in some the central growing part resembled crown gall, the periphery showing the development of adult differentiated tissue or parenchyma, which is claimed to be a part of the new growth and not of the normal tissues of the inoculated plant. The same is said to be true of rudimentary organs (conducting system), or even of a whole rudimentary organism (leafy shoot), which may appear at the periphery or in some other portion of the ordinary crown gall. This appearance of highly differentiated tissues subsequent to and participating in the development of a malignant tumor is, it is claimed, unknown in animal cancer.

The conclusion arrived at is that a fast developing simple crown gall presents much analogy to animal cancer and offers ideal material for the cellular study thereof. The structure of the growing central part is identical in practically all crown galls thus far investigated. This structure, therefore, represents only one type among the large number of pathological processes grouped under the name of cancer. The study of crown gall, however, affords no secure ground for a claim that all human cancers are formed through the activity of an identical organism.

[Plant diseases studied at the California Station] (*California Sta. Rpt. 1919, pp. 17–20, 32, 33, 34, 35, 42, 43, 46*).—The citrus nematode (*Tylenchus semipenetrans*) is said to be found in all of the principal citrus districts of the State, attacking 12 citrus varieties (but no other plants so far as known), including sour and sweet orange and pomelo, all three of which are used extensively as root stocks. The attack on the feeding rootlets (piercing the cell wall and breaking down the tissues) gives ready entrance to Fusarium and other fungi. The nematodes are found on roots, ranging from within an inch of the surface to 12 ft. below, and being associated invariably with a poor condition of the trees. No completely successful method of protection has been found.

Studies by J. T. Barrett and H. S. Fawcett on citrus fruit spots, stains, and blemishes are noted. Some of these troubles have been traced to definite causes, several stains and spots being caused by the wither-tip fungus (*Colletotrichum glœosporioides*), which is discussed in connection with its adaptation and its supposed continued production of new types under natural conditions. A new lemon spot, designated as green pit, has been found in three sections of the State, always in connection with a Septoria. A storage scald has become important this season.

Citrus gummosis (*Pythiacystis citrophthora*) has been shown by Fawcett to be preventable, and curable when taken in time. A study of the causal organism as regards its growth relations has aided in the explanation of differences in seasonal occurrences and in rate of enlargement of disease areas. Temperature relations of growth have been studied in this fungus, also in *Phytophthora terrestria*, *Phomopsis citri*, and *Diplodia natalensis*. The results, besides bearing upon the relations between temperature and growth, aid also in explanation of the occurrence and geographical distribution of some of the diseases produced by these fungi.

Citrus psorosis, or scaly bark, is found to be transmissible under certain conditions, but the time required for the development of lesions, even when small, is long, usually months or even years. In early stages only, the disease may be practically controlled. Internal decline of lemons has been studied further by Barrett and Fawcett in a limited way. The typical trouble shows maximum occurrence in July–September. It may occur on trees of any age or condition. No parasitic organism has been found in this connection. Citrus root rots appear to be more prevalent than when first reported. Two types were found by Barrett to occur, one of these, a dry rot, attacking at the crown, penetrating into and through the heartwood, and causing sudden wilting and death of the tree; another, more difficult to detect, causing a decay of the tap and lateral roots from their extremities toward the trunk, which may cause a decline continuing for years. A Fusarium has been isolated from both types. Citrus chlorosis, when severe, is found to be connected with a limy subsoil. A basal hypothesis is offered to explain experiments by C. B. Lipman which are described, in which iron sulphate sprayed on the leaves restored the normal green color.

June drop of the Washington navel orange, a cause of great losses in California, was shown by J. E. Coit and R. W. Hodgson to be due in part to *Alternaria citri* (which was but little affected by spraying), but in the main to a stimulus to abscission arising from daily water deficits in the developing fruits, arising from climatic conditions. Citrus blast, though easily killed by drying on exposure, was found by H. A. Lee to live in cuttings for more than four months, sufficiently long to carry through the summer. It occurs in all the citrus districts of northern California, particularly among oranges.

Fruit-tree spraying experiments showed that dry lime-sulphur used with dormant peach and apricot trees in fall and winter is fully as effective as is liquid lime-sulphur or Bordeaux mixture in protecting trees against leaf curl, twig blight, and shot-hole fungus. As a summer (full leaf) spray, dry lime-sulphur produced the same foliage effect as did the other sprays.

Shot-hole and twig blight of stone fruits were studied during 1916 and 1917 in an extensive cooperative experiment carried out in several counties. Shot-hole of almond is controlled by the spring spray only, while the December spray is the most effective with peaches. Apricot shot-hole was not controlled by the usual sulphur preparations and Bordeaux mixture, but thinning out the tops reduced the disease somewhat. Twig blight was not reduced by the dormant spray nor by spraying after the fruit had set. Apricot limb gall, studied by Khazanoff, appears to be due to a Monochætia, probably a new species. The galls are due to increase in thickness of the bark mainly. The disease is prevalent in Alameda, Santa Clara, and San Benito Counties, attacking trees over 15 years old and spreading until the tree is practically destroyed.

Apricot bacterial gummosis, rather serious in character, has been studied by Barrett since 1916. It is believed to be caused by *Pseudomonas cerasus*. Activity of the organism seems to be confined largely to the dormant period, being checked by the growth activities of spring. The killing of large areas of bark in a short time may girdle and destroy large branches or even trees. Infection occurs in the fruit spurs. The disease is now known to occur in 8 counties, including the best apricot regions of the State. Control measures found effective are almost exclusively surgical.

Crown gall resistance in plums, studied by C. O. Smith, shows great variability as regards varieties, some of the more promising of which are to be tested under different climatic and soil conditions.

Walnut dieback, or winter killing, may, it is found by L. D. Batchelor and H. S. Reed, prevail even in the absence of temperature extremes. This injury may prove to be the result of one condition or several resulting in the desiccation of the twig. Probable causes are indicated in some detail. A new walnut variety named Ehrhardt, supposedly resistant to walnut blight, has been taken under observation. Walnut blight resistance has been studied by C. O. Smith in commercial varieties and found to behave in artificial much as in natural inoculation, though certain of the varieties more resistant under natural conditions showed much greater susceptibility under conditions of artificial inoculation. It has been shown that the blight organism can live for at least 2.5 months in sterilized soil, dying out in 10 days or less in unsterilized soil. This is thought to be due to competitive conditions among the soil organisms.

Walnut blight control experiments, involving removal of all possible sources of infectious materials and spraying pruned and unpruned plats with Bordeaux mixture or lime-sulphur, were carried out by Fawcett and Batchelor during 1916 in Orange and Ventura Counties. The results agreed with those previously obtained in showing little, if any, reduction of the blight.

Cereal smuts have been studied by W. W. Mackie since 1917 in cooperation with the U. S. Department of Agriculture and the College of Agriculture. The reduction of smut due to cooperative effort during 1917 was exceeded by that of 1918, following which considerable areas were found to be smut free.

Phytopathology [Mauritius, 1918], D. D'EMMEREZ DE CHARMOY (*Ann. Rpt. Dept. Agr. Mauritius, 1918, pp. 10, 11*).—This account as given includes insect pests and other parasites of plants.

Pigeon pea showed for the first time a root disease which is ascribed to a fungus not yet identified. Sugar cane root disease appeared to have been much more prevalent than formerly, cases being reported in five districts, and affecting both virgin canes and ratoons. More than eight different fungi have been isolated, but none of these has been shown to cause the disease. Bacterial heart rot of sugar cane was reported from various districts. Bacterial wilt of potato and tobacco is more serious on the latter.

Treating oats for smut, W. L. BURLISON and R. W. STARK (*Illinois Sta. Circ. 240 (1920), pp. 4*).—The authors recommend the use of formaldehyde solution for control of oat smut by sprinkling a solution of 1 pt. of formalin in 10 gal. water at the rate of 1 pt. of solution per bushel of oats. The oats should be thoroughly mixed, covered, and allowed to remain covered for about 2 hours, after which they are uncovered and the gas allowed to escape.

Basal glumerot of wheat, L. MCCULLOUGH (*Jour. Agr. Research* [*U. S.*], *18 (1920), No. 10, pp. 543–551, pls. 2*).—In the course of a study made in the Bureau of Plant Industry, U. S. Department of Agriculture, on wheat samples, a bacterial disease unlike the black chaff was discovered. This disease is due to a hitherto undescribed organism, and was found on heads of wheat collected in widely separated localities in the United States and Canada. The most noticeable external character of the disease is a brown to black discoloration on the lower part of the glumes and of the adjacent rachis. The grains inclosed in the diseased glumes were found to have bacteria in their tissues at the germ end. In advanced cases this end of the grain is black and charred in appearance. The organism causing the disease has been isolated, not only from freshly collected material but also from grain kept in the laboratory for 17 months. The author describes the organism as *Bacterium atrofaciens* n. sp.

Fusarium wilt of chile pepper, L. H. LEONIAN (*New Mexico Sta. Bul. 121 (1919), pp. 32, figs. 7*).—A wilt of chile pepper, known to have existed on the station farm since 1908 and to have been serious or destructive since 1911, was studied after the latter date, principally during 1918–19.

The causal organism, which is regarded as belonging to the section Martiella of the genus Fusarium, has been named *F. annuum* n. sp. It attacks some or all of the underground parts and often the lower aerial stem. The development of the characteristic dark brown sunken lesions is attended by wilting (usually sudden), total disintegration of the root hairs, breakdown of the cork cambium, disintegration of the cortical cells, and development of white or bluish sporodochia on the underground parts.

The fungus grows saprophytically in soils of ordinary fertility, and the infective material is carried by means of diseased plant remains, possibly by seed bed plants, also by air and water.

The wilting is probably due not to a mechanical stoppage of water movement by the growth of hyphæ in the passages, nor to the production of toxic substances, but to a general failure and breakdown of the tissues invaded.

The severest outbreaks occur in August or September, a certain relation existing between temperature and the occurrence and severity of the attack. The optimum temperature appears to be near 31° C., the highest actual temperature in the fields being about 25° and the minimum temperature permitting infection about 17°.

Soil moisture appears to be the chief controlling factor, an 85 per cent wilting occurring when the capillary moisture much exceeds 12 per cent, as against 2 per cent at a content below that point. Intelligent and careful irrigation is, therefore, a principal control measure. Heavy soils should be avoided. Ridging and the use of windbreaks are also recommended.

A new lettuce disease, R. C. Thomas (*Mo. Bul. Ohio Sta., 5 (1920), No. 1, pp. 24, 25, fig. 1*).—The occurrence of a new lettuce disease in greenhouses is reported. Preliminary investigations are said to indicate that the disease is identical with that recently described by Brown as due to *Bacterium vitians* (E. S. R., 39, p. 455).

Temperature relations of certain potato-rot and wilt-producing fungi, H. A. Edson and M. Shapovalov (*Jour. Agr. Research* [*U. S.*], *18 (1920), No. 10, pp. 511–524, figs. 9*).—In a contribution from the Bureau of Plant Industry, U. S. Department of Agriculture, the authors give an account of experiments of pure cultures of six species of Fusarium and two strains of *Verticillium alboatrum*.

The two strains of Verticillium, one from the South and the other from the North, showed distinctly different thermal behavior. As a result of their investigations, a certain degree of correlation was found by the authors to exist between the temperature relations of some potato fungi in pure cultures and their geographical distribution and seasonal occurrence. This correlation is said to be particularly striking in *F. oxysporum* and *V. alboatrum*.

From the results obtained, they believe that a temperature of about 40° F. should hold Fusarium tuber rots in check during storage. The susceptibility of *V. alboatrum* to high temperatures is believed to suggest the possibility of a heat treatment for infected seed tubers. The use of temperature tests in certain cases is deemed by the authors to offer a useful supplementary method for the identification of fungi exhibiting contrasting thermal relationships.

Potato disease treatment [at Crookston, Minn.], C. G. Selvig (*Minnesota Sta., Rpt. Crookston Substa., 1917–18, pp. 51–55, fig. 1*).—Tests were made of seed potatoes noticeably affected with such common tuber diseases as Rhizoctonia and scab. The tubers were treated with formalin, corrosive sublimate, or copper sulphate, or else the cut seed tubers were dusted until supplied with a good adherent coating of air-slaked lime or powdered sulphur. Despite variability in the results through a period of years, the increased yields and cleaner product are considered to justify seed treatment, as well as rotation.

Formalin applied to cut seed has retarded germination a few days, but the plants as a rule appeared normal by midsummer, and the treatment was followed by an increased yield of tubers. Uncut seed were not retarded by the application of formalin. Corrosive sublimate, whether applied before or after cutting the seed, was more efficient in controlling disease, but there was only a slight increase of tubers. The application of air-slaked lime appeared of value only for its fertilizing effects, and sulphur as here used had little or no effect as a fungicide.

Tests were made on leaf diseases with Bordeaux mixture of 5:5:50 strength before 1917, and of 4:4:50 afterward. Spraying was begun in June when the plants were from 6 to 8 in. high and was repeated at intervals of two weeks. It was found that the largest average yield and the greatest net return were obtained from plants which had received three sprayings. The fourth application did not pay for its employment. General spraying appeared to be successful for the Red River Valley even in years of but little early blight. Late blight has not yet been recorded for this region.

Commercial lime-sulphur appeared to be detrimental in 1916, but in 1917 there was a slight increase in yield. Self-boiled lime-sulphur is considered as offering promise on account of its low cost and results obtained.

Silver-leaf disease (including observations upon the injection of trees with antiseptics), F. T. Brooks and M. A. Bailey (*Jour. Pomol., Vol. 1, No. 2, pp. 81–103*).—In order to duplicate as far as possible in different localities work previously noted (E. S. R., 30, p. 451; 38, p. 50), the authors carried out experiments at Cambridge and at the John Innes Horticultural Institution.

As regards the physical factors in silvering, the authors still consider that by far the greater part of the peculiar appearance of plum leaves in the earlier stages of silvering is due to the formation of abnormal air spaces below the upper epidermis, whereby the character of the light normally reflected is changed.

Further observations upon the occurrence and incidence of silver leaf are noted and discussed. Inoculation experiments were carried out with the plum, apple, and other plants. It appears that this disease is not inseparably connected with inoculation by *Stereum purpureum*. Following experiments on the curative treatment of silver-leaf disease, it is admitted that there is at present no known curative treatment that can be applied on a commercial scale with prospect of success, but it is considered probable that any measures conducive to the general well-being of the trees would tend to reduce the danger.

Shot-hole fungus (*Bd. Agr. and Fisheries* [*London*], *Leaflet 247* (*1911*), *pp. 4*, *figs. 3*).—This gives a brief account of the manner and results of attacks by *Cercospora circumscissa*, which are common on leaves of the peach, almond, cherry, apricot, and nectarine, and less so on those of the plum and other rosaceous trees. Remedial measures exclude Bordeaux mixture on account of foliage injury, but prominence is given to self-boiled lime-sulphur in this connection.

Red root disease [of Hevea], T. Petch (*Trop. Agr.* [*Ceylon*], *52* (*1919*), *No. 1, pp. 27–34*).—This disease, first seen in Ceylon in 1905, occurred rather commonly in 1914 on Hevea and *Tephrosia candida* at Peradeniya. It has since been recorded from several estates in the low country, being still ranked among the less common of the root diseases of Hevea in Ceylon. The disease (ascribed to *Poria hypobrunnea*) is discussed in regard to its occurrence, spread, symptoms, and relation to other root diseases, and in regard to control measures including prevention, tree surgery, and chemical fungicides. Attention is also directed to white stem blight and top canker of Hevea.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Forced movements, tropisms, and animal conduct, J. Loeb (*Philadelphia and London: J. B. Lippincott Co.* [*1918*], *pp. 209*, *pls. 4*, *figs. 38*).—In this volume, which is the first of a series of monographs on experimental biology, the author discusses the symmetry relations of the animal body as the starting point for the theory of animal conduct, forced movements, galvanotropism, heliotropism (the influence of one source of light), an artificial heliotropic machine, asymmetrical animals, two sources of light of different intensity, the validity of the Bunsen-Roscoe law for the heliotropic reactions of animals and plants, the effect of rapid changes in intensity of light, the relative heliotropic efficiency of light of different wave lengths, change in the sense of heliotropism, geotropism, forced movements caused by moving retina images (rheotropism and amemotropism), stereotropism, chemotropism, thermotropism, instincts, and memory images and tropisms.

A bibliography of 554 titles is included.

The rat as a carrier of diseases transmissible to man and to other lower animals, A. G. R. Foulerton (*Jour. Compar. Path. and Ther.*, *32* (*1919*), *No. 3*, *pp. 182–191*).—Noted from another source (E. S. R., 42, p. 355).

Rat bite fever.—Report of a case, A. Arkin (*Arch. Int. Med.*, *25* (*1920*), *No. 1, pp. 94–111*).—A summary of information on this disease, caused by

Spirochæta morsus muris, followed by a report of a case in a boy of 9 years bit by a rat. References are given to the more important literature on the subject.

On a coenurus in the rat, M. Turner (*Ann. Appl. Biol., 6 (1919), No. 2–3, pp. 136–141, fig. 1*).—This is a report of studies of tapeworm cysts found in the rat in London which represent either a new species or a very atypical form of a known species.

A mouse oxyurid, Syphacia obvelata, as a parasite of man, W. A. Riley (*Jour. Parisitol., 6 (1919), No. 2, pp. 89–93, pl. 1*).—This records the infestation of a family of five in the Philippine Islands by *S. obvelata*.

Report on a collection of Copepoda made in Honduras by F. J. Dyer, C. D. Marsh (*Proc. U. S. Natl. Mus., 55 (1920), pp. 545–548, pl. 1*).

Catalogue of birds of the Americas, C. B. Cory (*Field Mus. Nat. Hist. [Chicago] Pub. Zool. Ser., 13 (1919), pt. 2, No. 2, pp. 317–607, pl. 1*).—This part of the work previously noted (E. S. R., 39, p. 759) deals with the families Trogonidæ, Cuculidæ, Capitonidæ, Ramphastidæ, Galbulidæ, Bucconidæ, and Picidæ. An index to the volume is appended.

Third and fourth annual lists of proposed changes in the A. O. U. Check List of North American birds, H. C. Oberholser (*Auk, 35 (1918), No. 2, pp. 200–217; 36 (1919), No. 2, pp. 266–273*).—These lists are in continuation of those previously noted (E. S. R., 39, p. 154).

Birds of North Carolina, T. G. Pearson and C. S. and H. H. Brimley (*N. C. Geol. and Econ. Survey [Rpt.] 4 (1919), pp. XXIII+380, pls. 30, figs. 275*).—Sketches on North Carolina ornithology and life zones and bird distribution and an explanation of keys and descriptions are followed by a descriptive list of North Carolina birds containing 341 species and varieties (pp. 17–335). A bibliography of eight pages on North Carolina birds, tables on fall and spring migration of birds at Raleigh, 1895–1911, data on song period of birds at Raleigh, and a brief glossary are appended. A subject index and indexes to the common and scientific names are also appended.

The 24 colored plates with one exception are by R. B. Horsfall.

Birds in town and village, W. H. Hudson (*New York: E. P. Dutton & Co. [1920], pp. X+323, pls. 8*).—This is a popular account based upon English conditions.

British birds, their nests and eggs, and how to name them, W. M. Gallichan (*London: Holden & Hardingham, Ltd., 3. ed., pp. 152, figs. 84*).—A small handbook.

The birds of the Tambelan Islands, South China. H. C. Oberholser (*Proc. U. S. Natl. Mus., 55 (1920), pp. 129–143*).

Notes on birds collected by Dr. W. L. Abbott on Pulo Taya, Berhala Strait, southeastern Sumatra, H. C. Oberholser (*Proc. U. S. Natl. Mus., 55 (1920), pp. 267–274*).

Notes on Dr. W. L. Abbott's second collection of birds from Simalur Island, western Sumatra, H. C. Oberholser (*Proc. U. S. Natl. Mus., 55 (1920), pp. 473–498, fig. 1*).

A revision of the subspecies of the white-collared kingfisher (Sauropatis chloris), H. C. Oberholser (*Proc. U. S. Natl. Mus., 55 (1920), pp. 351–395*).

The races of the Nicobar megapode (Megapodius nicobariensis), H. C. Oberholser (*Proc. U. S. Natl. Mus., 55 (1920), pp. 399–402*).

Notes on the wrens of the genus Nannus, H. C. Oberholser (*Proc. U. S. Natl. Mus., 55 (1920), pp. 223–236*).

Report of entomologist, W. E. Hinds (*Alabama Col. Sta. Rpt. 1919, pp. 26, 27*).—In this brief report of the work of the year, it is pointed out in connection with the work with *Calandra oryza* that the selection of a weevil-resistant type of seed ear is the first important step to be taken in control work. Next in importance is the utilization of the trap plat method of concentrating the first generation of rice weevils in the field so that they may be controlled economically by proper handling of the small amount of corn that is grown on this trap area.

Reference is also made to soil fumigation work with sodium cyanid now under way.

Entomological investigations (*California Sta. Rpt. 1919, pp. 68–70*).—Investigations made by C. W. Woodworth while in China confirm the view that with the present cost of labor sericulture can not be commercially profitable in California.

In a special study by Woodworth of the problem of mosquito control in the lowlands of Yangtze Valley in China the practical use of the ordinary inspection net as a means of control was demonstrated. In sanitary work at Newport News, Va., W. B. Herms demonstrated the practicability of drainage for mosquito control under conditions of scarcely any fall, in which drainage canals serve as a means for concentrating water rather than carrying it off the land. Since the mosquitoes thrive only in small pools this drainage work was almost as effective as that which would have occurred had the water been drained off.

In fumigation work in which carbon bisulphid was used, E. R. de Ong found the effect of gas on the germination of the seeds to be quite negligible even with excessive treatment (E. S. R., 41, p. 754). In cold storage work with insects he obtained considerable data on the length of time the various insects are able to survive exposure to different degrees of refrigeration. All of the rice weevils, with one exception, were killed in one month. The Indian meal moths were all dead in two months, but larvæ of the yellow meal worm can live over three months.

Extensive studies of the chemical and physical properties of liquid cyanid were made by G. P. Gray and E. R. Hulbrit (E. S. R., 41, p. 502), who originated a method for determining the concentration by the use of the thermometer and specific gravity spindle. They also investigated the action of cyanid upon metals.

Reference is made to insecticide statistics compiled by Gray, an article relating to which has been previously noted (E. S. R., 40, p. 59). Of $3,000,000 spent annually in California for insecticides. one-third is spent for cyanid and about one-sixth for sulphur.

A survey of the forest areas of Santa Cruz County and a partial survey of the National Forests of Monterey and Santa Barbara Counties, made by G. A. Coleman with the view to increasing the output of honey, resulted in finding some 47 suitable locations for new apiaries, about 25 of which are now occupied or are about to be occupied.

Reference is made to a study of the natural breeding areas of the beet leafhopper by H. H. Severin, accounts of which have been previously noted (E. S. R., 41, pp. 456, 755).

Division of entomology and economic zoology, W. A. Riley (*Minnesota Sta. Rpt. 1919, pp. 45–47*).—Field experiments are said to show that under ordinary conditions Nicofume and soap will kill 65 per cent of the potato-leaf hoppers, whereas under laboratory conditions 99 to 100 per cent were killed. Life history studies were made of the oak twig girdler with the view to finding a satisfactory method of control. It appears that the only possible method is to trim all dead branches from the trees and burn them with their insect contents. *Camponotus pennsylvanicus* was a serious enemy of cedar in the State, the average infestation running from 15 to 25 per cent in the swamps and from 40 to 70 per cent on higher land. Brief reference is made to other work under way. A nematode hitherto unknown as a parasite of man has been discovered and evidence adduced to show that it is transmitted through food contaminated by rodents.

Report of the department of entomology, T. J. Headlee (*New Jersey Stas. Rpt. 1918, pp. 205–295*).—The author first presents a tabular list of insects and other animals received and identified during the year, 82 in number. Brief reference is then made to the occurrence of and work during the year with plant lice, the potato flea-beetle, tomato flea-beetle (*Epitrix fuscula*), the oriental peach moth, horse-radish flea-beetle (*Phyllotreta armoraciæ*), and the seed-corn maggot (*Pegomyia fusiceps*).

Investigations of the pear psylla led to the conclusion that the recommendations as to control measures made in the report of 1916 (E. S. R., 39, p. 761) should be followed in their entirety. The least important of three treatments is the scraping of the rough bark from the trees in late fall or early winter. The faithful annual practice of the winter and spring spraying, accompanied by as much scraping as may be necessary to keep the trees clean, will bring the pear psylla under reasonably satisfactory control. Thoroughness of coating coupled with the proper time of application is absolutely essential to success. Particular attention was given during the year to control work with the plum curculio. The schedule for the application of lime-sulphur and arsenate of lead recommended in 1917, namely, (1) before the buds swell, (2) as the blossoms first show color, (3) directly after the petals fall, (4) 10 days after the blossoms fall, and (5) June 20 to 30 for all fall and winter varieties, was modified in 1918, so that the fourth application was made 7 days after the petals fell and an additional application made 17 days after the blossoms fell. Those who applied the extra spray with sufficient thoroughness eliminated the normal curculio injury. Particular mention is made of two parties, one at Allaire and the other near Clementon, who succeeded in eliminating serious curculio damage by closing up the gap between the blossom-fall and the 10-days-after-blossom-fall spray by the introduction of another spray as outlined in the new schedule. Better results are secured with a mixture of lime-sulphur and lead arsenate than with lead arsenate alone, the lime-sulphur appearing to have a repellent action.

An account is next given of the sprinkling sewage filter fly (*Psychoda alternata*), by T. J. Headle and C. S. Beckwith (pp. 214–221), accounts of which from other sources have been noted (E. S. R., 40, p. 356; 41, p. 165). The cranberry investigations were taken over by the department of entomology during the year and work was carried on by C. S. Beckwith, the data presented relating particularly to fertilizer experiments (pp. 222–230) and being abstracted on page 837. A report is made of studies of eggs of apple aphids by A. Peterson (pp. 231–234), a bulletin relating to which has been previously noted (E. S. R., 41, p. 253).

Experiments with tarred paper collars and other substances for protection against the peach tree borer are reported by A. Peterson (pp. 234–243), in continuation of the work of the previous year (E. S. R., 41, p. 58). The report relates particularly to extensive experiments made with tarred paper collars commercially known as Scott's tree protectors. Details relating to the application of these protectors are presented. The results obtained from those placed about the base of 75 or more of 8 to 10 year old trees in three distinct portions of the peach orchard at Clementon are reported upon in tabular form. While no conclusion can be drawn as to the value of the tarred paper disks the results are indicative of what may be expected in another year. Only a few large larvæ were found at the end of the season in November when the trees were bored. The protectors in the southeast and northeast parts of the orchard are said to have reduced the infestation 90 per cent and 75 per cent in the southwest portion.

Experiments were also tried with various chemicals or common spray materials sprayed on the trunks at intervals of 10 days to 2 weeks. In all cases the number of small larvæ present in the spring of the year apparently indicates their ineffectiveness. Applications of nicotin resinate, 1 part to 100 parts of water, from one to three times failed to reduce the number of larvæ. Applications of Scalecide 1:15 on July 25, August 6, and August 18 did not injure the trunks, but the number of larvæ was not materially reduced. Applications of Scalecide 1:20 plus crude carbolic acid 1 per cent and applications of fish-oil soap 1 lb. to 25 gal. of water plus crude carbolic acid 1 per cent applied on the same dates also failed to reduce the number of larvæ materially.

A detailed report is given of the mosquito work carried on during the period from November 1, 1917, to June 30, 1918 (pp. 243–295).

[Report of the] department of entomology, H. C. Severin (*South Dakota Sta. Rpt. 1919, pp. 14–18*).—This report deals briefly with the results of studies of the web-spinning sawfly of plum and cherry (*Neurotoma inconspicua*) and the common field cricket (*Gryllus abbreviatus*).

N. inconspicua is generally distributed in South Dakota, but the greatest amount of damage is done in the eastern third of the State. It attacks principally wild plums (*Prunus americana*), the common garden plums (*P. domestica*), Canada plums (*P. nigra*), western sand cherry (*P. besseyi*), the compass cherry (*P. besseyi*×*americana*), and the hybrid plums *P. besseyi*×*P. triflora*, *P. americana*×*P. simonii*, and *P. americana*×*P. triflora*. The injury consists of the destruction of the foliage by the gregarious web-spinning larvæ, the entire foliage of the tree being devoured and an unsightly web covering the branches and uneaten midribs of the leaves, where the pest is at all abundant.

The first sawflies are found in the first or second week of June. Egg mass averaging 46 eggs is laid by each female upon the undersurface of the midrib of the leaves of plum, sand cherry, etc. These hatch in a period of 4 to 8 days. The larvæ feed for 2 or 3 weeks upon the leaves, whereupon they drop to the ground, enter it to a depth of 1.5 to 10.5 in. and hollow out a chamber. Here they remain inactive throughout the remainder of the summer, fall, winter, and early spring, and pupate the latter part of May and early June. The adults emerge in from 1 to 2 weeks later.

A tachinid fly (*Eubrachymera debilis*) at times destroys as high as 50 per cent of the sawfly larvæ, but the host is killed only after it has reached its full growth and entered the ground. Larvæ of Chrysopa and nymphs and adults of *Podisus maculiventris* are important predacious enemies. The application of arsenate of lead, 2 lbs. of paste or 1 lb. of powder, to 50 gal. of water when the larvæ are small, is the most satisfactory artificial control measure. The use of other arsenical compounds is advised against because of danger of burning the foliage.

G. abbreviatus is the source of considerable injury to alfalfa seed and seed pods, shocked grains, and binder twine. Two parasites attack the eggs, namely, *Ceratoteleia marlatti*, which is very common and is quite a factor in keeping down the numbers of this pest, and *Paridris* n. sp., which is not so common. The control measures recommended include the renovation of alfalfa fields in the fall to destroy the cricket eggs, plowing or disking and harrowing in the fall the fields containing the eggs, and burning cocks or stacks of old hay or thrashed alfalfa.

[Special entomological investigations in St. Vincent] (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. St. Vincent, 1918–19, pp. 13–18*).—The investigations reported relate to the life histories and control of the cotton stainer (*Dysdercus delauneyi*), the green bug (*Nezara viridula*), and the pea chink (*Edessa meditabunda*).

[Entomological notes], J. C. F. FRYER (*Ann. Appl. Biol., 6 (1919), No. 2–3, pp. 207–209*).—These notes relate to *Charaeas graminis*, the Angoumois grain moth, *Anthonomus pomorum*, *Phyllobius urticæ*, and *P. oblongus*.

Insect pests in 1918, R. S. MACDOUGALL (*Trans. Highland and Agr. Soc. Scot., 5. ser., 31 (1919), pp. 152–188, figs. 24*).—This paper, which deals with the occurrence of and work with the more important insects of the year, concludes with an introduction to the life histories of the Chermes.

Notes on certain parasites, food, and capture by birds of the common earwig (Forficula auricularia), H. H. BRINDLEY (*Proc. Cambridge Phil. Soc., 19 (1918), No. 4, pp. 167–177*).—A contribution to the knowledge of *F. auricularia*, in which the author gives the results of investigations of the effects of parasitism by the gregarine *Clepsydrina ovata* and of the nature of the food consumed. In a careful examination made of the alimentary canal of 46 males from the Isles of Sicily it was found that about half were infested by *C. ovata*, the average number of gregarines per individual being about 25. In food tests decided preference was shown for the leaves of vegetable marrow, beet, and cabbage, the blossoms of Anchusa and Œnothera, and unskinned plum fruit. A brief summary is given of the present knowledge of the capture of earwigs by birds.

Accounts of this pest in the United States by Jones (E. S. R., 38, p. 56) and Essig (E. S. R., 39, p. 464) have been noted.

"White ants" as pests in the United States and methods of preventing damage, T. E. SNYDER (*Mo. Bul. Dept. Agr. Cal., 9 (1920), No. 1–2, pp. 7–20, figs. 11*).—Noted from another source (E. S. R., 41, p. 355).

Formosan termites and methods of preventing their damage, M. OSHIMA (*Philippine Jour. Sci., 15 (1919), No. 4, pp. 319–383, pls. 13, figs. 5*).—"In Formosa three species of termite, namely, *Leucotermes flaviceps*, *Coptotermes formosanus*, and *Odontotermes formosanus*, are injurious to wooden structures. A pair of mature individuals of *C. formosanus* is able to start a new colony. In a newly established colony of *C. formosanus* egg laying begins 5 to 13 days after swarming. *C. formosanus* lays from 1 to 4 eggs a day. Eggs of *C. formosanus* hatch in from 24 to 32 days after they are laid. The soldier of *C. formosanus* develops from the egg laid by the queen. *C. formosanus* attacks lime mortar. The principal food of *C. formosanus* is cellulose."

The termite-proof concrete layer is deemed entirely satisfactory in preventing the entrance of termites from the ground. Teak and cypress pine are immune from the attack of Formosan termites. The resistance of timber is not due to its hardness or weight, or to the inorganic compounds contained in it, but to sesquiterpene alcohols that can be extracted by benzene or alcohol. Cypress pine contains "guajol," and Foochow cedar and Randai cedar contain "cedrol." Camphor green oil contains 25 per cent of sesquiterpene alcohol and is entirely satisfactory as a preventive for buildings. The anthracene oil fractionated from coal tar is also effective in preventing the damage of *O. formosanus*.

The outbreak of locusts in western Canada in 1919 (*Agr. Gaz. Canada, 7 (1920), No. 3, pp. 218–220, figs. 2*).—The outbreak of locusts which occurred in certain sections of Manitoba, Saskatchewan, Alberta, and British Columbia in 1919 is said to be the most important from an economic viewpoint that has been experienced since the West was developed as an agricultural region.

Harlequin cabbage bug and its control, F. H. Chittenden (*U. S. Dept. Agr., Farmers' Bul. 1061 (1920), pp. 13, figs. 5*).—A popular summary of information on the life history and habits and methods of control of this enemy of cole crops.

[Walnut aphis studies] (*California Sta. Rpt. 1919, pp. 43, 44*).—A new species of fungus, found by O. F. Burger and A. F. Swain in 1917 to be an important factor in controlling the walnut aphis in Southern California, has been given the name *Entomophthora chromaphidis* (E. S. R., 39, p. 464).

A brief account is given of the work of R. E. Smith with nicotin dust applied by large power-driven blowing machines. This has proved to be a very effective means of control, the walnut aphis being almost completely destroyed when the dust was applied with reasonable thoroughness. The original method of preparation of the dust consisted in diluting blackleaf 40 with considerable water, mixing with the desired proportion of kaolin from Ione, Cal., into a stiff mud, and then drying in air or with a little heat and repulverizing, several days at least being required to complete the process. At the present time a mixture of 75 per cent kaolin and 25 per cent hydrated lime is made in a mechanical mixer, and during the mixing process the desired amount of blackleaf 40 is blown into the mass in a fine spray, without any dilution. The lime dries out the moisture and also has a chemical effect, freeing the nicotin from the sulphate and rendering it much more active and effective, though less permanent, nicotin being more volatile than its sulphate. By the use of other machinery the material is further mixed and pulverized and the finished product delivered into sacks, 12 minutes being required to complete the whole process for each 400-lb. charge of material.

A mixture containing 2.5 per cent blackleaf 40 (1 per cent nicotin) is being used for the walnut aphis, from 1 to 4 lbs. of material being applied per tree, according to size. Two men with a team and a blower can thoroughly dust from 2 to 4 acres per hour. The total cost is from $3 to $5 per acre. Thus far, more than 5,000 acres have been dusted and it has not been necessary to dust more than once during the season. An account by Hodgson has been noted (E. S. R., 41, p. 457).

A reference to the use of this dust against *Psylla mali* in Nova Scotia by Brittain has been noted (E. S. R., 41, p. 755).

Injury to silkworms by caterpillars of the brown-tail moth, Y. Abe (*Abs. in Rev. Appl. Ent., Ser. A, 6 (1918), No. 11, pp. 501, 502*).—Irritation by the hairs from brown-tail moth caterpillars caused a sudden loss of appetite of silkworms followed by inactivity and emesis of green fluid.

Insects resembling European corn borer, H. A. Gossard (*Mo. Bul. Ohio Sta., 4 (1919), No. 12, pp. 372–379, figs. 8*).—Brief descriptions and accounts of the habits are given of insects resembling the European corn borer (*Pyrausta nubilalis*), including the bollworm, the lined stalk borer (*Hadena fractilinea*), corn stalk maggot (*Chætopsis ænea*), sod webworms (*Crambus* spp.), a native pyraustid caterpillar (*P. ainslici*), the parsnip webworm (*Depressaria heracliana*), etc.

The lined stalk borer (*H. fractilinea*) was frequently received during the summer, having caused serious local damage in eight different counties in the northeastern part of the State. This caterpillar, which resembles the stalk borer (*Papaipema nitela*), becomes active in June and enters the stems of corn at the tips and bores downward. Irregular holes appear in the growing tip very much as if the work were done by the common stalk borer. As much as one-third of the stand in fields of 10 acres was reported destroyed. A closely related species, *Luperina stipata*, works in much the same way as *H. fractilinea*, but enters the corn plant lower down and burrows upward instead of downward. The life history is not completely known, but since the larvæ occur from May to July and the adults have been captured from July to September it is thought there is but one brood a year. The eggs are laid in the fall, and timothy sod appears to be a favorite place for oviposition. Nearly all the severe damage to corn thus far reported has been on timothy sod plowed in the spring and sometimes late in fall. The eggs are supposed to hatch in the fall and the caterpillars probably hibernate as partially-grown cutworms. It is thought that early fall plowing of timothy sod will control this pest as well as related cutworms.

The corn stalk maggot (*C. ænea*) is often found in the stalks and under the leaf sheaths of a number of valuable crops, such as corn, sorghum, onions, sugar cane, broom corn, wheat, oats, rushes, and wild grasses. While they are generally scavengers aggravating a previous injury, it appears that healthy plants may also be attacked by them. The damage caused is quite similar in general outward appearance to the breaking over of the tassels by the European corn borer. The eggs are inserted beneath the leaf sheaths, and the maggots either feed near where they hatch or seek out some bruised spot where entrance to the interior of the plant is easy. The larvæ, if immature when winter arrives, hibernate at least in many cases. There appear to be three or four broods per year. Control in corn is practically accomplished by removing and feeding the stalks as fodder or by converting them into silage.

California oak worm (Phryganidia californica), H. E. BURKE and F. B. HERBERT (*U. S. Dept. Agr., Farmers' Bul. 1076 (1920), pp. 11, figs. 9*).—This lepidopteran of the family Dioptidæ appears in enormous numbers every few years and strips the live oak (*Quercus agrifolia*) and the white or valley oak (*Q. lobata*) of their leaves in the valleys of central California. In addition it becomes a general nuisance by crawling on lawns, walks, fences, and into houses, swimming pools, etc. It is a native California insect which, though occurring most abundantly in the San Francisco Bay region, is found in most of the coast region where the live oak grows from Sonoma County to southern California. In addition to the live oak and valley oak, it feeds on various other species of native and introduced oaks, the American chestnut (*Castanea dentata*, and in some cases on the blue gum (*Eucalyptus globulus*).

The young worms eat the pulp from the surface of the leaf between the netted veins, feeding on either surface, but more often on the upper. The older worms feed on the edges of the leaves, eating everything down to the main ribs. There are two generations of the species during the year, the worms being most noticeable during April and May and again in August and September; the moths during June and July and again in October and November. The eggs are laid on the leaves of the oaks and many other trees, on the bark of the trunks, on the grass under the trees, etc. Those placed on the leaves are laid in more or less regular rows in groups of from 2 to 40 on the undersurface of the leaf. They hatch in from 10 to 15 days in the summer time and from that to 4 months in the winter time. The larvæ molt from 3 to 6 times, 5 being the normal number. About 2 weeks are passed in the pupal stage.

The eggs, larvæ, and chrysalids are destroyed by the spined soldier bug (*Podisus maculiventris*). The larger larvæ are destroyed by a small grayish tachinid, *Thryptocera-flavipes*, and the pupæ are parasitized by *Chalcis abiesiæ* and *Itoplectis behrensi*. A bacterial disease is said to destroy large numbers of the larvæ. As a control measure the author recommends the use of from 3 to 5 lbs. of arsenate of lead paste, or 1.5 to 2.5 lbs. of the dry powder, dissolved in 50 gal. of water and applied by means of a power sprayer. This should be applied in April, and again if necessary about August 1, while the worms are in the younger stages and are more easily killed and have done very little damage.

The western oak looper (*Therina somniaria*) which defoliates oaks in Oregon and Washington in a similar manner should not be confused with *P. californica*.

Notes on the life history of Ephestia kuehniella, R. V. Wadsworth (*Ann. Appl. Biol., 6 (1919), No. 2-3, pp. 203-206*).—Brief notes are given on the biology of the Mediterranean flour moth.

The life history of the toon shoot and fruit borer, Hysipyla robusta (Lepidoptera; Pyralidæ; Phycitinæ) with suggestions for its control, C. F. C. Beeson (*Indian Forest Rec., 7 (1919), No. 7, pp. [IV]+71, pls. 13, figs. 2*).—This is a monographic account of *H. robusta*, which attacks the young shoots of the toon tree, boring its way along the pith. It attacks trees both in plantations and in the forests, preferring those about 3 ft. in height and of strong growth. The species occurs in India, Burma, Ceylon, Perak, British New Guinea, and Australia. Studies of its seasonal history and life history are presented in detail, much of the data being given in tabular and chart form. A bibliography of 29 titles is included.

The ultimate seasonal infection of malarial fever, with the mosquito carrier as the indicator, B. Mayne (*Pub. Health Rpts. [U. S.], 34 (1919), No. 35, pp. 1969-1972*).—The author, having considered it practicable to develop a sanitary indicator for malaria prophylaxis in the determination of the initial and terminal infection found existing among mosquitoes collected in districts where malaria thrives, presents some information pertaining to ultimate infection. It is pointed out that the date up to which time mosquitoes are infective and beyond which time they are not differs with the place and year. At Lenwil, in northern Louisiana, the date was between October 20 and November 1 in 1917.

The ox warble or ox bot flies (Hypoderma bovis and H. lineatum), R. S. MacDougall (*Trans. Highland and Agr. Soc. Scot., 5. ser., 31 (1919), pp. 94-121, figs. 8*).—This is a review of the present status of knowledge of the life history and habits and means of prevention and remedial measures for the ox warbles, which are dealt with in connection with a bibliography of 33 titles.

Observations on the more common aphidophagous syrphid flies, C. H. Curran (*Canad. Ent., 52 (1920), No. 3, pp. 53-55*).—The author's observations relate to *Allograpta obliqua*, *Sphærophoria cylindrica*, *Syrphus americanus*, *S. ribesii*, *S. torvus*, *Paragus tibialis*, and *P. bicolor*.

On a new saccharomycete, Monosporella unicuspidata n. g. and n. sp., parasitic in the body cavity of a dipterous larva (Dasyhelea obscura), D. Keilin (*Parasitology, 12 (1920), No. 1, pp. 83-91, figs. 3*).—The saccharomycete here described as new was found in a ceratopogonid larva (*D. obscura*), which usually lives in the thick brown sap that fills the infected wounds of elm or horse chestnut trees. A list is given of 16 references to the literature.

Calwer's beetle book.—Introduction to the knowledge of the beetles of Europe, C. Schaufuss (*Calwer's Käferbuch. Einführung in die Kenntnis der Käfer Europas. Stuttgart: E. Schweizerbart'sche Verlagsbuchhdlg., 1916, 6. ed., vols. 1, pp. 88+709, pls. 20, figs. 250; 2, pp. 709-1390, pls. 28, figs. 4*).—In the introductory part of this work a general account is given of the beetles, their structure, development, life history, collection and rearing, preservation and mounting, determination and classification, sale and exchange, a table for the identification of the comman ants of Germany (pp. 66-68), and a table for the separation of the families of beetles occurring in the Palearctic region (pp. 69-88). The main part of the work takes up the various families of beetles, commencing with the Cicindelidæ, giving descriptions of the genera and species. Illustration of the beetles are in colors, as many as 36 being given on a single plate and a total of 1,400 being illustrated.

Two Philippine leaf-mining buprestids, one being new, C. S. BANKS (*Philippine Jour. Sci., 15 (1919), No. 3, pp. 289–299, pls. 3*).—A descriptive and biological account is given of *Endelus bakeri* found in blotch mines, singly, on the leaves of the bird's nest fern (*Asplenium nidus*). *E. calligraphus*, which forms galleries in the leaves of *Asplenium* sp., is described as new.

Notes on the biology of Necrobia ruficollis (Coleoptera, Cleridæ), H. SCOTT (*Ann. Appl. Biol., 6 (1919), No. 2–3, pp. 101–115, figs. 2*).—This is a report of studies of a clerid beetle, the larvæ of which are usually saprophagous, but which sometimes return to the predacious habits characteristic of the family and kill and devour other larvæ. They have been observed to eat the soft parts of dead adult flies and to kill and eat fly maggots.

A list of 28 references to the literature is appended.

Some insect relations of Bacillus tracheiphilus, F. V. RAND and L. C. CASH (*Phytopathology, 10 (1920), No. 3, pp. 133–140, fig. 1*).—The investigations here reported have been summarized as follows:

"It is clear that a small percentage of striped cucumber beetles harbor the wilt organism internally when they enter the cucurbit fields in the spring, and there appears to be no other source for their infection than the cucurbit crop of the preceding autumn. Infections may take place from the mouth parts, at least for a limited time after feeding upon wilted plants, and infections are shown to occur when the feces of some beetles, but not all, come into contact with fresh injuries to the leaves. Infections take place only through injuries involving the vascular system. *B. tracheiphilus* has been isolated directly from the viscera of wilt-fed striped cucumber beetles. Beetles of the genus Diabrotica (proved for two species) are the only carriers of the disease so far known in nature."

On the life history of "wireworms" of the genus Agriotes, with some notes on that of Athous hæmorrhoidalis, I, A. W. RYMER ROBERTS (*Ann. Appl. Biol., 6 (1919), No. 2–3, pp. 116–135, pl. 1, figs. 5*).—This is a report of biological studies by the author, together with a review of the literature, a list of 25 references to which is included.

Notes on the apple root weevil (Leptops hopei), W. W. FROGGATT (*Agr. Gaz. N. S. Wales, 31 (1920), No. 1, pp. 56–60, figs. 7*).—Injury is caused by the larvæ of *S. hopei*, which do not bore into the roots but after working their way down the trunk eat away the bark and gouge a regular furrow along the outer surface, following around until all the bark of the main roots and the surface wood are devoured and the damaged root rots. There is said to be but one previous record of its root injury in New South Wales, but it has been found on various occasions doing considerable damage to the opening buds of vines and fruit trees.

The maize billbug or elephant bug (Sphenophorus maidis), W. P. HAYES (*Kansas Sta. Tech. Bul. 6 (1920), pp. 5–27, figs. 12*).—This is a report of studies conducted in southern Kansas in 1914 and 1915, an account of which work by the author has been previously noted (E. S. R., 35, p. 760). Studies of this species by Kelly have also been noted (E. S. R., 25, p. 159), as have studies of the southern corn billbug by Webster (E. S. R., 27, p. 162), Smith (E. S. R., 29, p. 56), and Metcalf (E. S. R., 37, p. 666).

Since the studies of this beetle commenced, in 1914, it has been a source of damage to planted corn in Cowley, Butler, Marion, and Greenwood Counties and is known to occur in four other counties. It is found principally along river valleys of the southern part of the State, and does slight injury on second-bottom land, but only rarely on the higher land. Dispersion takes place almost entirely through the ability of the adult to walk from field to field, it never having been observed to fly.

The injury is caused both by the adult beetle and the larva, each being of a distinct type. Punctures made by the adult while feeding kill a large number of plants soon after they break through the ground and during their early stages of growth. The plants that survive or escape injury from the feeding of the adult beetles are subject to a more severe type of damage from the feeding of the larvæ. Large cavities are dug out of the plant by the adults in which to lay their eggs, from which the larvæ hatch and at once begin feeding and burrowing into the heart of the plant. The burrows increase in size and eventually extend from the taproot to several inches above the surface of the soil. This does not always kill the plant, but causes the upper leaves to assume a pale, wilted appearance and the whole plant to become gnarled and distorted. The stalks grow slowly, sucker profusely, and seldom produce ears.

In addition to corn, rosin plants and swamp grass have been recorded as food plants. While field corn is the principal crop injured by the beetle, it at times thrives on sweet corn, cane, Kafir corn, and feterita.

The eggs are laid in slits made by the female in the plant at or near the surface of the soil and sometimes in the soil near the corn plant. The incubation period of the egg varied from 4 to 25 days, with an average of 8.2, in 1914, and from 5 to 39 days, with an average of 12.26, in 1915. The length of the larval stage ranged from 40 to 60 days, with an average of 52.5, in 1914, and from 32 to 69 days, with an average of 42.83, in 1915, when reared on corn. The period on kafir corn was from 32 to 68 days, with an average of 47.5; on cane, 39 to 75 days, with an average of 54.83; on feterita, 38 to 52 days, with an average of 44.42; and on sweet corn, 43 to 56 days, with an average of 48. Pupæ are found in the field during late summer and early autumn in pupal cells in or near the taproot of the infested plant. The pupal period varied from 10 to 13 days, with an average of 11.4, in 1914, and from 9 to 30 days, with an average of 13.84, in 1915. The majority of the beetles pass the winter in their pupal cells within the cornstalks.

"Summing up the seasonal appearance of this billbug, we find the adults present in the fields throughout the fall, winter, spring, and larger part of summer; eggs may be found in May, June, and sometimes in July; larvæ from the first part of June to the middle of September; pupæ are present from the latter half of July to the last of September. There is but one generation annually, though adults that have lived through the winter will sometimes be abroad after their progeny have matured."

The species has few natural enemies, none having been recorded. Fall plowing is said to be a fairly effective control measure, since it breaks up the winter quarters of those beetles hibernating within the cornstalk and disturbs all others more or less. The cheapest, most satisfactory, and most practicable method of control is the use of a cropping system in which corn does not follow corn.

The four-spotted cowpea weevil (Bruchus quadrimaculatus), O. WADE (*Oklahoma Sta. Bul. 129* (*1919*), *pp. 3–14, figs. 6*).—The damage caused to the cowpea by the four-spotted cowpea or bean weevil in Oklahoma is said to have increased at an alarming rate in recent years. In the present paper the author presents a summary of information on its life history and habits and control measures.

During the year 1918–19 seven generations and a partial eighth were reared by the author under conditions simulating those of the ordinary storage house. Eggs are deposited on the green pods in the field or on the seed through vents in the pods, the average number deposited per female varying from 11 to more than 100, 75 being about the average under favorable conditions. The larvæ, which hatch out in from 5 to 20 days (average 6 to 8), bore directly down through the pod into the seed. From 17 to 40 days are passed in the larval stage and from 7 to 19 (average 8 to 10) in transformation of the larvæ to adults. Thus the life cycle varies from 30 to 35 days in the summer up to 82 days under lower temperature conditions.

Bruchobius laticeps was found to be a common parasite of this weevil in Oklahoma, making its appearance in late June and early July and again in late September and October. During 1918 it was present in considerable numbers, and in several quantities of stored cowpeas being used for breeding purposes it was effective enough finally to rid the peas of the weevil completely. Tests made demonstrate that the weevil can be effectively controlled and stored cowpeas protected from damage by either of two methods, which are both practicable for common use. The first consists of storing cowpeas in ordinary bins or common sacks after having mixed the seed with air-slaked lime, using 1 part of the lime to 8 parts peas by weight. The other consists in the fumigation of cowpeas with carbon bisulphid, using not less than 5 lbs. carbon bisulphid to 1,000 cu. ft. of space, dosing three times at intervals of one week, then sacking in bags of close weave and tight seams, and tying the tops securely.

Observations at the station failed to show the presence of *B. chinensis* in as great numbers as *B. quadrimaculatus*, or that it causes as much damage.

Hypera nigrirostris in the Pacific Northwest, L. P. Rockwood (*Canad. Ent., 52 (1920), No. 2, pp. 38, 39*).—The author records the occurrence of *H. nigrirostris* from Vancouver, B. C., southward through Washington to its southern limits in Oregon at Garden Home in the Willamette Valley, Forest Grove in Tualatin Valley, and Nehalem on the coast.

Bathyplectes exigua, a European species hitherto not recorded in the United States and apparently without host record in Europe, was found to parasitize about 50 per cent of the early cocoons of *H. nigrirostris* at Puyallup, Wash. In 1919, adults of this parasite were swept from clover at Forest Grove and were present at Nehalem on the ocean front. A species identified as *B. exigua* has been reared from a larva of *H. punctata* at Mechanicsburg, Pa. *Dibrachoides dynastes*, a pteromalid parasite attacking the pupæ within the lacy cocoons, was found in some numbers during the seasons of 1918 and 1919 at Puyallup and Auburn, Wash.

The black banana stem weevil (Cosmopolites sordidus), W. W. Froggatt (*Agr. Gaz. N. S. Wales, 30 (1919), No. 11, pp. 815–818, figs. 6*).—This weevil, originally described from Java, was first recorded on the Tweed River from a banana plantation near Stoker's Siding, where the bananas have since been dug out. At the present time the infested district appears to be the Condong Range, where there are a number of plantations more or less badly attacked. It has previously been recorded as a pest of banana at Redland Bay, Queensland.

A brief account is given of its life history and habits.

American foulbrood, G. F. White (*U. S. Dept. Agr. Bul. 809 (1920), pp. 46, pls. 8, figs. 9*).—This monographic account is similar in nature to the works of the author on sacbrood (E. S. R., 36, p. 659) and on Nosema disease (E. S. R., 41, p. 359). The work has been summarized by him as follows:

"American foulbrood is an infectious disease of the brood of bees caused by *Bacillus larvæ*. All larvæ, worker, drone, and queen are susceptible to the infection; adult bees are not. Man evidently is not susceptible to infection with the organism nor are the experimental animals. So far the disease has not been encountered or produced in other insects than honeybees. The brood of bees can be infected through feeding the spores of the bacillus to a colony.

The spores contained in a single scale are more than enough to produce considerable disease in the colony. The portal of entry of the infecting agent is somewhere along the alimentary tract of the larva, most likely the stomach (midintestine). Practically speaking there are no secondary invaders either during the life of the infected larva or during the decay of the remains. The incubation period is approximately 7 days. The brood is susceptible to infection at all seasons of the year. More brood dies of the disease during the second half of the brood-rearing season than during the first half.

"The disease is present at least in Australia, New Zealand, Denmark, England, Ireland, Germany, France, Switzerland, Canada, Cuba, and the United States. The ropy foulbrood of all these countries is one and the same disease. Occurring as it does in such a wide range of climatic conditions, it is evident that the presence of the disease can not be attributed alone to any particular climate.

"The course of the disease in the colony is not affected greatly, if at all, by the quality of food used by the bees, or by the quantity present. Colonies in which the disease has been produced through artificial inoculation can be kept in the experimental apiary without transmitting the disease to others. This fact is of special importance not only in the technique of making studies, but also in the control of the malady.

"The spores of American foulbrood remain alive and virulent for years in the dry remains (scales) of larvæ and pupæ dead of the disease and in cultures that have become and remain dry. The spores are very resistant to most destructive agencies. A variation in resistance is noted both as to the individual spores of a sample and as to the spores contained in different samples. Many of the spores are killed within 1 minute at 100° C., and all of them from some samples are killed in less than 5 minutes. In some instances 96° maintained for 10 minutes will destroy all of the spores, while 98° will often do it. The most resistant of the spores studied when suspended in water have not withstood 100° for 11 minutes. The spores withstand more heating when they are suspended in honey or honey diluted with water than when suspended in water. The spores suspended in honey or diluted honey can be destroyed by 100°, but it may require half an hour or more to do so.

"American foulbrood spores when dry were destroyed by the direct rays of the sun in from 28 to 41 hours. The spores when suspended in honey and exposed to the direct rays of the sun were destroyed in from 4 to 6 weeks. The spores when suspended in honey and shielded from direct sunlight remained alive and virulent for more than a year. It is very likely that they are capable of remaining so for a very much longer period.

"The spores resisted the destructive effects of fermentation for more than 7 weeks at incubator and outdoor temperatures, respectively, and probably are able to withstand these agencies for a very much longer period. The spores resist carbolic acid at room temperature in strengths ordinarily used as a disinfectant for periods of months; 1 to 1,000 mecuric chlorid for days; 10 per cent formalin for hours. Experiments recorded in the present paper indicate that drugs do not materially affect the course of the disease.

"American foulbrood infection is transmitted primarily through the food of bees; possibly at times to some extent through their water supply. Robbing from the diseased colonies of the apiary, or from neighboring apiaries, is the most likely mode by which the disease is transmitted in nature. The placing of brood combs containing diseased brood with healthy colonies will result in the transmission of the disease. Flowers should not be considered as a likely medium through which infection may take place. Whether the disease is ever transmitted by queens or drones has not been determined. That they have been overestimated at times as possible sources of infection seems likely. It is quite probable that in many cases hives which have housed colonies infected with American foulbrood will not transmit the disease to healthy colonies transferred to them. Results from the present studies confirm the observation made by beekeepers that danger from this source may be removed by properly flaming such hives inside. The clothing of those about an apiary, and the hands of the apiarist are not fruitful sources for the transmission of the disease. Tools and bee supplies generally about an infected apiary will not transmit the infection in the absence of robbing from those sources.

"American foulbrood usually can be diagnosed from the symptoms alone. A definite diagnosis can always be made from suitable samples by bacteriological methods. The prognosis in the disease in the absence of treatment is decidedly grave, but with proper treatment it is favorable. From the technical viewpoint many of the problems considered in these studies have been solved only partially; from the practical point of view, however, the results are sufficient to make a logical, efficient, and economic treatment of American foulbrood possible."

A list of 29 references to the literature is appended.

Control of American foulbrood, E. F. PHILLIPS (*U. S. Dept. Agr., Farmers' Bul. 1084* (*1920*), *pp. 15, figs. 5*).—This publication, based upon the work above noted, gives a popular account of preventive and remedial measures for American foulbrood. In controlling this disease it is necessary that all combs, honey, and other materials from the inside of the hive be taken from the bees, and that a chance be given them to establish themselves again on new combs. Several methods are given in this publication, but the underlying principle is the same in all cases.

A study of the behavior of bees in colonies affected by European foulbrood, A. P. STURTEVANT (*U. S. Dept. Agr. Bul. 804* (*1920*), *pp. 28, figs. 6*).—This report of a series of investigations started at Cornell University in 1918 has been summarized as follows:

"European foulbrood is an infectious disease. *Bacillus pluton* was found to be the primary invader, appearing in the intestinal tract of larvæ before death, contemporary with the first slightly apparent symptoms. The variation in the appearance of the diseased larvæ after death is due to the presence or absence of secondary invaders.

"The period of incubation for European foulbrood was found to be from 36 to 48 hours, although the gross symptoms usually do not become apparent in less than 3 or 4 days, varying with conditions of honey flow and strength of colony. It has been noted in apiary practice that the first brood of the year usually escapes with little loss. During the first 5 to 7 days the spread of the disease in the colony after infection is slow, after which the increase is rapid under favorable conditions. The critical time, therefore, to detect the disease and start treatment is early in its course, thus making conditions unfavorable.

"The evidence tends to confirm the theory that one of the ways the disease is spread in the colony is by the house-cleaning bees, and from colony to colony by their drifting. It is quite probable that the infective organisms are carried on the mouth parts and pedal appendages. The question of infection from intestinal contents or from the source of larval food at various stages needs further substantiation.

"Irrespective of strength of colony, the Italian bees were found to resist infection much better than hybrids and showed more ability to overcome the disease. This apparent resistance of the Italian bees was observed to be largely due to the more vigorous house-cleaning characteristics rather than to a natural resistance or immunity to the disease. There was very little difference in the apparent period of incubation between the Italian and hybrid colonies, possibly a slight difference in favor of the Italians. Furthermore, it was noted that often there may be a slight recurrence of disease in the brood of the new Italian queen until a sufficient number of her bees have emerged to eliminate the infection by house cleaning. Apparently, infection is not always entirely removed by a period of queenlessness.

"As a rule, requeening is necessary in the treatment of European foulbrood, except possibly in the strongest Italian colonies, which show only slight infection. Where a considerable quantity of disease is present, sufficient to require treatment, it was found unsafe to use a period of less than 10 days' queenlessness, due to the infectious condition of the diseased material remaining and the accompanying behavior of the colony. The stronger the colony in Italian bees, the more rapid was the recovery.

"A heavy honey flow tends to prevent infection from gaining a foothold. It also tends to eliminate the disease if present before the start of the heavy honey flow. This was found to be due to the effect of dilution on the infection because of the influx and direct feeding of the fresh nectar to the larvæ.

"European foulbrood is a disease of weak colonies. It was found to be difficult effectually to infect any but the very weak colonies during the heavy honey flow. Therefore, colonies kept strong up to the time of the honey flow run very little danger of contracting European foulbrood. This and others of the facts observed are in exact harmony with facts already observed in apiary practice."

Determination of age in honeybees, H. L. M. Pixell-Goodrich (*Quart. Jour. Micros. Sci.* [*London*], *n. ser.*, *64* (*1920*), *No. 254*, *pp. 191–206*, *pl. 1*).—"For the study of those bee diseases with which no specific organisms have so far been identified it is important to be able to eliminate bees dying of old age, and this can not be done with certainty by observing outward symptoms. However, the age of bees, which normally work almost incessantly for about six weeks and then die, may be determined with some accuracy from a study of the brain cells. With advancing age the cytoplasm of these cells undergoes gradual reduction peripherally, until in senescence only a vestige is left surrounding the nucleus.

"The condition of the head glands, including a pair of esophageal glands which do not appear to have been previously recorded, gives some indication of age in normal healthy bees."

A list is given of 20 references to the literature.

A remarkable case of homing instinct, C. N. Ainslie (*Canad. Ent.*, *52* (*1920*), *No. 3*, *pp. 50–52*).—This relates to *Sphex vulgaris*.

FOODS—HUMAN NUTRITION.

A pink yeast causing spoilage in oysters, A. C. Hunter (*U. S. Dept. Agr. Bul. 819* (*1920*), *pp. 24*).—The investigation reported in this bulletin includes a study of the distribution of the pink yeast which has been found to be the cause of the development of a pink color in New England oysters shipped for some distance, of possible methods of controlling or preventing its development, and of the morphological, cultural, and biochemical properties of the organism.

The pink yeast, which belongs to the group of Torulæ, was found in largest numbers in the houses where the oysters were shucked and packed, to a considerable extent on the decks of the boats bringing in the oysters, to a much less extent (26.3 per cent of the samples examined) in the oysters before they were brought to the oyster house, occasionally in deep surface water samples from the oyster beds, and not at all in mud samples from the bottom of the bay. The principal source of contamination of the oysters is considered to be the process of handling in the oyster house.

The study of the yeast itself showed that it reproduces by budding, does not form spores, grows at room temperature but not at 37° C., and is killed at 64°. It does not produce acid, gas, nor alcohol in carbohydrate media, and does not produce indol or phenol. It reduces nitrates to nitrites and ammonia. The pink pigment produced by the yeast is insoluble in water, slightly soluble in alcohol and carbon disulphid, somewhat more soluble in chloroform, and very soluble in ether. The yeast resists drying for at least 100 days and is not affected by chemicals commonly employed in the disinfection of water, but is destroyed by a 0.04 per cent solution of formaldehyde (formalin 1:1,000).

It is thought that the pink yeast may be eliminated by systematic disinfection of oyster houses, utensils, etc., by thorough washing several times during the season with a formaldehyde solution of the above strength. The occasional appearance of the yeast in the water of the bay and in the oysters when taken from the water is considered traceable in large measure to the oyster shells, which after contamination with the yeast in the oyster houses are subsequently planted in the oyster beds.

[Whale meat] (*California Sta. Rpt. 1919, p. 58*).—As the result of artificial digestion experiments, conducted by H. A. Mattill, it is reported that whale meat is as easily digested as any other meat. Raw whale meat was not so completely digested at the end of 2.5 hours as raw beef, but more completely digested than the beef in 4 hours. In the cooked condition it was rather more quickly and completely digested than beef. The composition of whale meat is reported as follows: Water 71.22 per cent, ash 1.2, protein 23.13, fat 4.24, and undetermined 0.21 per cent.

[Control of mills by means of laboratory data], R. R. JACOBS and O. S. RASK (*Jour. Amer. Assoc. Cereal Chem., 4 (1919), No. 1, pp. 16–18*).—On the basis of data presented, the authors discuss the possibility of determining the quality of flour by laboratory mill control. The results of analyses of some flour and other milling products are given. The following conclusions are drawn:

"Wheat is composed of three parts, the endosperm or flour-producing protion, the bran tissue, and the embryo or germ. The flour-producing portion contains practically all the starch and only very small quantities of pentosans and fats, the pentosans forming in part the framework of the cellular structure of the endosperm.

"The bran tissue contains practically all of the pentosan, with small amounts of fat and no starch; the pentosan content of this bran tissue is constant. . . . The embryo or germ contains practically all of the fat, inappreciable quantities of pentosan, and no starch. Therefore, the amount of fat and pentosans in any grade of flour is a measure of the amount of offal (germ and bran) contained in that flour; conversely, the amount of starch contained in wheat or any mill product is a measure of the amount of endosperm and, therefore, of the amount of flour contained in that product.

"The accuracy of the flour yield determination of wheat as made by the ordinary experimental mill is dependent on two very important factors, the skill of the operator and the completeness of the equipment."

The determination of pentosans or starch may be used as a check on the miller's yield reports by the application of a formula which is given. The determinations and formulas may be used for obtaining the milling efficiency on a percentage basis.

The gastric response to foods.—VII, The response of the normal human stomach to vegetables prepared in different ways, R. J. MILLER, H. L.

Fowler, O. Bergeim, M. E. Rehfuss, and P. B. Hawk (*Amer. Jour. Physiol., 51* (*1920*), *No. 2, pp. 332–349, figs. 32*).—In this continuation of the investigation previously noted (E. S. R., 41, p. 857), a study was made of the response of the normal human subject to 30 different kinds of vegetables prepared in various ways in a total of 124 experiments made on 25 normal men.

The average evacuation time of all subjects of the rapid-emptying type was 2 hours, and of the slow-emptying type 2.5 hours. The averages of the highest acidities developed (expressed in cubic centimeters of N/10 alkali required to neutralize 100 cc.) were 70 to 77, respectively, for the two types.

"In general, raw vegetables low in protein, as carrots, celery, tomatoes, cabbage, lettuce, and cucumbers, leave the stomach rapidly, develop moderately high free acidities but little combined acidity, and leave the stomach without great change. Boiled vegetables show much more rapid and complete disintegration. Vegetables high in starch, such as potatoes, show very considerable starch digestion before leaving the stomach. In certain cases hardly any starch reaction could be obtained toward the end of digestion."

It is pointed out that the results obtained differ in many points from the results recorded by Beaumont in his well-known experiments on Alexis St. Martin.

[Chemical analyses of prunes, dried apricots, and almonds] (*California Sta. Rpt. 1919, pp. 35–38*).—Analyses by the nutrition laboratory of the station of samples of prunes and dried apricots from different localities for water and total sugar are reported, together with calculations of the sugar to a 25 per cent basis.

The percentage of water in prunes varied from 14.4 to 31.66 and in apricots from 11.5 to 38.4, the average of 14 samples of the latter being 26.9 per cent. The percentage of total sugar in the prunes ranged from 41.3 to 56.19 and in the apricots from 39.28 to 56.4, with an average of 47.19 for the latter.

Proximate analyses are reported of 14 varieties of domestic almonds and of 5 imported varieties. The average values for the domestic varieties were as follows: Water 5.74 per cent, ash 3.31, protein 23.72, fat 53.49, fiber 2.56, and nitrogen-free extract 11.38 per cent. The protein content of the imported varieties was lower than that of the domestic and the nitrogen-free extract proportionally higher.

The macroscopic and bacteriological investigation and valuation of canned meat, W. Frei and A. Krupski (*Schweiz. Arch. Tierheilk., 60* (*1918*), *No. 10, pp. 445–470; abs. in Vet. Rev., 3* (*1919*), *No. 1, pp. 25, 26*).—The authors discuss the macroscopic examination of tinned meat for the detection of bacteriological infection. The different conditions which may be met with are summarized as follows: If the tin is of normal appearance, impervious, and without bulging the contents may be macroscopically normal and bacteriologically sterile, or macroscopically normal and bacteriologically infected, or macroscopically abnormal and either sterile or infected. If the tin leaks it is to be considered infected in all cases whether macroscopically normal or spoiled. If the tin is swelled there is a possibility of the contents being macroscopically normal and sterile from reaction with the metal of the container, or the contents may be infected and be either macroscopically normal or altered.

Further remarks on the examination of canned meat, X. Seeberger (*Schweiz. Arch. Tierheilk., 61* (*1919*), *No. 11–12, pp. 367–377*).—Attention is called to the paper of Frei and Krupski noted above, and a different scheme is proposed for the examination of canned meats, depending upon the characteristic sound produced by the shaking of the cans under certain conditions.

Absence of this sound on shaking the can may be taken to indicate the absence of gas, with the exception of special cases where a thick layer of fat prevents the breaking of the gas against the tin. If the sound is produced the presence of gas is indicated. In cans containing no gas the contents may be liquid or solid or both, macroscopically normal and unchanged or decayed, and sterile or infected. In cans containing gas the contents may be macroscopically normal and unchanged, in which case the gas is either air due to incomplete filling of the can, or hydrogen formed by the reaction of the acid of the material on the metal of the container. If the contents are spoiled the gas contains, in addition to the above gases, decomposition products of the material.

The cans should be properly cooled before shaking.

Bacillus botulinus (*California Sta. Rpt. 1919, p. 58*).—Canned peas, corn, and fish, containing lemon juice as recommended by W. V. Cruess in Circular 158 (E. S. R., 36, p. 509), and control cans without lemon juice were inoculated by him with spores of *B. botulinus* and heated in boiling water for three hours. No bacterial growth or toxin was produced in the cans containing lemon juice, while those without lemon juice developed typical bacterial growth and sufficient toxin to kill guinea pigs.

A pictorial history of tea (*Tea and Coffee Trade Jour., 36 (1919), Nos. 5, pp. 417, 418, figs. 5; 6, pp. 512–515, figs. 7; 37 (1919), Nos. 1, pp. 30–32, figs. 4; 3, pp. 250–253, figs. 3; 38 (1920), No. 1, pp. 34–37, figs. 4*).—A large amount of historical information is brought together and summarized. The illustrations are reproductions of rare and unusual Oriental and other prints or drawings.

The history of food adulteration and its control, E. L. REDFERN (*Chem. Age [New York], 2 (1920), No. 3, pp. 439–441*).—This is a brief historical sketch of food adulteration from the middle ages to the present time.

The health officer, F. OVERTON and W. J. DENNO (*Philadelphia: W. B. Saunders Co., 1919, pp. 512, figs. 51*).—This volume contains chapters on milk, food sanitation, food values, disposal of household waste, water supplies, ventilation, camp sanitation, and child hygiene, as well as a long list of others dealing with orgnization (personnel), rural health work, management of epidemics, and related questions of interest in connection with the general subject of public health.

Emergency cooking for large groups of people (*Washington: American Red Cross, 1918, pp. 16*).—An instructor's manual prepared by the Bureau of Dietitian Service, American Red Cross. Suggestions are given for the organization and instruction of a class in the preparation of foods in quantity for war emergency purposes, including outlines for 15 lessons for class instruction in quantity cooking.

Government residence halls, Washington, D. C., M. CONYNGTON and L. MAGNUSSON (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 9 (1919), No. 4, pp. 9–15, figs. 4*).—Information is summarized in this account of the provision made during the war emergency situation for suitable accommodations at reasonable cost for the largely augmented number of Government women employees. Data are included regarding the kitchen and dining room equipment, cost of meals, and also concerning food and dietary problems.

[Attention to feeding employees in the] hygienic control of the anilin dye industry in Europe, A. HAMILTON (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 9 (1919), No. 6, pp. 1–21*).—The importance of proper feeding of men in dangerous trades is insisted upon, and information is summarized with regard to the anilin dye industry.

The diets of laboring-class families during the course of the war, M. FERGUSON (*Jour. Hyg. [Cambridge], 18 (1920), No. 4, pp. 409–416*).—The dietary studies of laboring-class families in Glasgow previously noted (E. S. R., 38, p. 267) have been supplemented by further studies of a few of the same families during later periods of the war. The present report summarizes the data obtained from five families including 3 men, 5 women, 12 children over 10 years, and 14 under 10 years of age in a series of four investigations as follows: (1) A part of the study previously noted, which was made in 1915–16 when there were no dietary restrictions; (2) in February, 1917, when, although prices were high, all foodstuffs except potatoes were still plentiful; (3) in November, 1917, after voluntary rationing had been urged by the Food Ministry; and (4) in December, 1918, during the period of compulsory rationing of meat, sugar, and fats.

The summarized data of these four studies indicate that rationing had little effect upon the energy value or the protein content of the diets, but tended to decrease the amount of fat consumed. This reduction in fat was attributed to the fact that where strict economy is necessary the housewife of the class studied generally relies upon margarin as her chief source of fat. Although there was a weekly ration of lard, none of the five families purchased it. The one family whose diet showed an increase of fat had had an advance of income during the war, and purchased considerable unrationed bacon and sausage during this period. Slightly more meat and sugar were eaten during the period of compulsory rationing than in the preceding two periods.

In general the food consumed during the different periods was determined much more by the income and dietary habits of the families than by the restrictions of rationing. This is brought out forcibly by the fluctuations in the energy value of the dietaries of one of the families following changes in income.

With the exception of the family with fluctuating income, the energy available in the food of all families studied furnished the children of these families only 40 per cent above their basal requirement. This energy came chiefly from bread and potatoes, the diets including almost no milk, no eggs, and but little meat, fish, and fat. These children were markedly below the average in height and weight. This interruption in growth is considered to be due to the insufficient supply of food, particularly of that containing the accessory growth-promoting factors.

Japan's food scarcity, F. Miyamoto (*Japan Mag., 10 (1920), No. 9, pp. 354, 355*).—The food situation and food needs in Japan are discussed.

Malnutrition (*Pub. Health Serv. U. S., Keep Well Ser., No. 11 (1920), pp. 12*).—This leaflet discusses in simple terms the symptoms, causes, and treatment of malnutrition in children, and offers suggestions for their proper feeding. Tables are included of the standard weight and height for boys and girls from 5 to 18 years of age.

Nutritional edema and "war dropsy," M. B. Maver (*Jour. Amer. Med. Assoc., 74 (1920), No. 14, pp. 934–941*).—An extensive review is given of the literature on war edema and its relation to deficiency diseases and also on experimental edema, and the results obtained in a study of experimental edema in dogs, rats, and guinea pigs are reported briefly.

Most of the instances of distinct edema were observed in animals living on a diet poor in protein and fat and containing much fluid. It is pointed out that these results agree fully with those reported by Kohman (E. S. R., 42, p. 557) and also with the clinical evidence.

"This condition does not seem to be a typical 'deficiency disease' in the sense of being the result of a deficiency in one or more specific unknown constituents (vitamins) in the diet. In a broader sense it is, however, a deficiency disease, and is the result of a protracted existence on a diet deficient in total calories, especially in protein. Undoubtedly, a high fluid intake, and possibly a high salt intake, are important accessory features."

Fifty-six references to the literature are included.

The experimental production of edema as related to protein deficiency, E. A. Kohman (*Amer. Jour. Physiol., 51 (1920), No. 2, pp. 378–405, figs. 5*).—This is the complete report of the investigation previously noted (E. S. R., 42, p. 557).

The nature and function of the antineuritic vitamin, R. A. Dutcher (*Proc. Natl. Acad. Sci., 6 (1920), No. 1, pp. 10–14*).—The literature concerning the chemical characteristics and metabolic functions of the antineuritic vitamin is reviewed, and studies at the Minnesota Experiment Station supplementing those previously noted (E. S. R., 41, p. 766) are reported briefly.

An experiment conducted by S. D. Wilkins has shown that a diet of polished rice causes extreme atrophy of the testicles of cockerels. That this was due to the lack of vitamin in the rice has also been shown in experiments in which one testicle only was removed from the rice-fed bird and green alfalfa then added to the rice diet. On removing the remaining testicle at a later period it was found to have grown to a much larger size than the one first removed. It has been found possible to obtain decided atrophy of the testes in cockerels without any loss in body weight, thus eliminating the starvation or inanition hypothesis.

Attention is called in this connection to the conflicting conclusions of Jackson and Stewart (E. S. R., 42, p. 664) and of Osborne and Mendel (E. S. R., 34, p. 562) on the capacity to grow after prolonged undernutrition. It is suggested that the failure to produce normal growth on refeeding noted by the first authors was due to too extensive pathological changes (atrophy) caused by a quantitatively inadequate diet, while the remarkable growth on refeeding of the animals in the latter case was probably due to the fact that the diets were adequate with respect to vitamins, so that in consequence the organs and ductless glands had received sufficient nourishment to prevent decided atrophy.

"The hormones from the ductless glands undoubtedly influence to a marked degree the activity, health, growth, and well-being of animals. May it not be possible that the hormone supply is dependent upon the vitamin content of the food? As a result of our observations, we wish to suggest tentatively that the activity of the organs of internal secretion is dependent upon the stimulatory action of the vitamin. Whether this is in the nature of a nerve stimulant, nuclear nutrient, or the chemical nucleus of a hormone is, of course, a matter of speculation."

The metabolism of carbohydrates, J. A. Hewitt and J. Pryde (*Jour. Physiol., 53 (1920), No. 5, p. LXV*).—This is a preliminary contribution on the stereochemistry of certain carbohydrates in the alimentary canal. A determination of the percentage absorption of glucose indicated that the relative proportion of the α and β forms in the intestine is not that of an equilibrated aqueous solution, but it has not yet been determined whether this may be attributed to preferential absorption of one form, or to a change in stereoisomerism, or to the formation of another variety of glucose.

ANIMAL PRODUCTION.

Inbreeding and outbreeding: Their genetic and sociological significance, E. M. East and D. F. Jones (*Philadelphia and London: J. B. Lippincott Co., 1919, pp. 285, pls. 13, figs. 31*).—In this monograph the authors expound the problems of inbreeding and cross-breeding from the point of view of current research in genetics, and review a large number of published observations on self-fertilized and cross-fertilized plants and inbred and out-crossed animals.

It is concluded that inbreeding and outbreeding have no influence on the size, vigor, or fertility of the progeny apart from the influence which the method of breeding necessarily exerts on the distribution of Mendelian characters. In the chapter on the cause of hybrid vigor the authors discard the idea that this phenomenon is due to the stimulus of heterozygosis, as suggested by East and Shull independently in 1911, and adopt Jones' theory (E. S. R., 38, p. 367) of dominant linked genes. However, the original explanation is employed in other chapters for expository purposes, and the term heterosis is retained. Pearl's definition of inbreeding is adopted, and his scheme of measuring inbreeding is explained but not made use of.

Four introductory chapters on reproduction and the chromosome theory of heredity are inserted for the benefit of nontechnical readers. There are two chapters on the rôle of inbreeding and outbreeding in evolution and in the improvement of animals and plants under domestication, and two on inbreeding in man and the question of race mixtures. The bibliography includes 225 titles.

Partial and complete duplicity in chick embryos, G. W. TANNREUTHER (*Anat. Rec., 16 (1919), No. 6, pp. 355–367, figs. 6*).—Four whole mounts of double or nearly double chick embryos and an early blastoderm with four primitive streaks are figured and described. Poor heat regulation during incubation is assigned as the cause of the abnormalities.

Relative abundance of serum proteins in albino rats at different ages, I. TOYAMA (*Jour. Biol. Chem., 38 (1919), No. 1, pp. 161–166, fig. 1*).—The author reports that the percentage of total protein in the blood serum of white rats increases rapidly during the suckling period, decreases slightly at puberty, and then increases slowly. The changes in general parallel the changes in refractive index of the serum studied by Hatai (E. S. R., 42, p. 262). A sharp temporary drop in the globulin content at the end of the suckling period is attributed to the change from a milk to a solid diet.

The feeding value of Sudan grass, G. G. ST. CLAIR POTTS (*Agr. Gaz. N. S. Wales, 30 (1919), No. 9, pp. 657, 658*).—The author gives chemical analyses of Sudan grass (at four stages of maturity) and Japanese millet made by F. B. Guthrie, and cites a practical test indicating the superiority of Sudan grass over *Paspalum dilatatum* as a pasture grass for milch cows.

Inspection of commercial feedstuffs, P. H. SMITH and E. S. MIXER (*Massachusetts Sta. Control Ser. Bul. 11 (1919), pp. 3–32*).—The proximate composition of 1,084 samples of feeding stuffs collected during the year ended August 31, 1919, are tabulated. These include cottonseed meal and feed, linseed meal, corn germ meal, corn gluten meal and feed, hominy feed, corn meal, corn feed meal, coconut oil meal, peanut oil meal, brewers' dried grains, yeast and vinegar grains, wheat bran, middlings, shorts, red dog, wheat mixed feed, durum wheat bran and shorts, rye "feed," oat "feed," barley feed, barley middlings, barley mixed feed, velvet bean feed, dried beet pulp, alfalfa meal, meat scrap, meat-and-bone scrap, tankage, fish meal, bone meal, and a variety of mixed and proprietary stock and poultry feeds and calf meals.

The bulletin also includes tables giving (1) the fertilizer constituents of 18 unmixed feeds and 22 compounded proprietary feeds, based on analyses by H. D. Haskins and L. S. Walker, (2) the prices and protein- fat- and fiber-content of 14 unmixed feeds during the years 1916 to 1919, and (3) the monthly fluctuations in wholesale prices of 20 feeding stuffs from September, 1918, to August, 1919. There are two brief notes by J. B. Lindsey entitled: What Kind of Grain Shall I Purchase? (pp. 27, 28), and Low-grade Feeds (p. 29).

Better sires.—Better stock (*U. S. Dept. Agr., Bur. Anim. Indus., 1919, pp. 16*).—This pamphlet outlines the plan of a "crusade" on the part of the Bureau of Animal Industry to increase the number of good pure-bred sires in use in the United States. Any breeder of cattle, horses, asses, swine, sheep, goats, or poultry who agrees to employ only pure-bred sires of good quality may be enrolled and is then given an official emblem which he is at liberty to display. The enrollment campaign began October 1, 1919.

Fifty-fourth annual live stock report, 1919 (*Union Stock Yard and Transit Co., Chicago, Ann. Live Stock Rpt., 54 (1919), pp. 53*).—Daily receipts and shipments of adult cattle, calves, hogs, sheep, and horses during 1919 are tabulated and totaled by months. Annual receipts and shipments from 1865 to 1919 are also given.

Review of the frozen meat trade, 1919, W. WEDDEL & Co., LTD. (*Weddel's Ann. Rev. Frozen Meat Trade, 32 (1919), pp. 26, pl. 1*).—A statistical summary of the British import trade in beef, mutton, and lamb carcasses during 1919, with comparative data for previous years and other countries.

The frozen meat industry of New Zealand, M. A. ELIOTT (*New Zeal. Jour. Sci. and Technol., 1 (1918), Nos. 3, pp. 157–166, figs. 2; 4, pp. 193–200, figs. 2*).—An account of the development and extent of the frozen meat industry of New Zealand, with statistics of the export trade in beef and mutton.

Beef production, K. J. J. MACKENZIE and F. H. A. MARSHALL (*Jour. Bd. Agr. [London], 25 (1918), No. 6, pp. 623–640*).—This is a summary of a report to the Board of Agriculture and Fisheries of the authors' investigations of the dressing percentage of various types of beef animals, and its relation to the amount of fat wasted, the edible quality of the meat, and the general question of the most economical condition for slaughter.

A total of 92 animals were slaughtered in the course of the work, and all the butchering was done by one man. Particular attention was given to the proportion of bone, cartilage, lean, and gross fat of the seventh rib "joint." To get a measure of the degree of marbling in the muscle, "the central portion of the iliospinalis muscle (which extends from the neck back to the hindquarters, often called the 'eye' of the joint by butchers), was carefully dissected out from the surrounding fascia and interstitial fat; the substance of the muscle was dried, and the intermuscular fat extracted. A portion of the same muscle from the wing rib and first cut of loin was treated similarly."

The following table summarizes these data:

Influence of finish of steers on proportions of fat and other tissues in rib cuts of beef.

Dressing percentage.[1] Class range.	Number of steers.	Tissues in butcher's cut of seventh rib.				Fat in iliospinalis muscle.	
		Cartilage.	Bone.	Extra-muscular fat.	Muscle and included fat.	Seventh rib.	Thirteenth rib.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
50-52	10	3.7	18.4	15.5	62.1	11.8	6.4
53-54	28	3.3	17.3	18.4	60.6	12.9	8.6
55-56	26	2.6	16.9	21.5	58.4	17.3	12.5
57-62	20	2.4	16.0	21.4	56.9	20.4	13.9

[1] Based on fasted liveweight.

The authors hold that, largely through the teachings of J. B. Lawes, an undue importance has been attached to degree of fatness in estimating the yield of carcass. "The error tends to leave a very large proportion of our cattle feeding too long because the estimator believes them to be low in yield of carcass, since the percentage of fat is only normal or 'useful.' He is, in other words, waiting till he feels fat on the animal, which will most likely produce a high percentage of dripping but need not necessarily give the nation a large amount of useful meat."

Cooking trials at King's College for Women and at a munition workers' hostel showed little discrimination on the part of patrons between animals of different dressing percentage. "The two series of trials demonstrate clearly that meat obtained from beasts of comparatively low percentage can be satisfactorily cooked, served, and eaten (and without giving rise to any complaints), and with a minimal quantity of waste. In the case of young animals which are moderately well bred, the meat from a carcass even as low as 51 per cent can be eaten by the public without hardship, but it is no doubt easier to spoil a bad joint in the cooking than it is to spoil a good one."

Cattle and the future of beef production in England, K. J. J. MACKENZIE (*Cambridge, Eng.: Univ. Press, 1919, pp. X+[1]+168*).—This book is primarily a detailed inquiry into the economic basis of beef raising in Great Britain to which is appended a series of chapters devoted to the merits of individual breeds.

Estimates are given showing the poor returns in human food per acre from the prevalent practice of keeping "stores" for three years or more until they are mature enough to utilize large quantities of cake and roots to make prime beef. It is held that there are other ways of maintaining soil fertility besides "supplying plant food through the excreta of overfed bullocks," and that the beef needs of England can be met to a great extent by fattening baby beef. The author deplores a recent effort on the part of the British Government to popularize the Holstein as a dual purpose breed, and holds that the Shorthorn and similar breeds are best adapted for the ordinary farm where both beef and milk must be produced.

F. H. A. Marshall provides a chapter on the physiological aspects of beef fattening which is mainly an account of the investigation noted above. It is stated that publication of the complete report has been postponed, perhaps indefinitely.

[Sheep feeding experiments at the California Station] (*California Sta. Rpt. 1919, pp. 78, 79*).—Conclusions drawn from experiments by R. F. Miller are noted.

A comparison of three kinds of sorghum silage fed with alfalfa hay for fattening lambs showed that feterita silage ranked first in economy of gain, sweet sorghum second, and milo maize third. The addition of barley improved these rations. Coconut meal and cottonseed meal were found to be desirable supplements to barley and alfalfa. Alfalfa hay as sole feed was very unsatisfactory. Ordinary barley stubble was worth about 75 cts. an acre when lambs were selling at 7 cts. a pound. At the same selling price of lamb, alfalfa meal and molasses feed was found to be worth $10 a ton and was thus an expensive producer of gains. Spineless cactus was found unpalatable and produced slower gains than corn silage.

The addition of beet pulp to silage and alfalfa was found valuable in fattening old ewes for the market.

Bureau of Animal Industry range sheep experiment, F. R. MARSHALL (*Natl. Wool Grower, 7 (1917), No. 1, pp. 35, 36*).—This is a brief summary of some records of the experimental work with range sheep conducted by the U. S. Department of Agriculture at Laramie, Wyo.

During the years 1910 to 1915, 72.8 per cent of the yearling ewes lambed, and of these 86.5 lambed again as two-year-olds. Of the ewes which did not lamb as yearlings 88.8 per cent had lambs the following year.

For three successive years a lot of 17 ewes were hand-shorn and a similar lot machine-shorn, and for two years another lot of 12 were hand-shorn and a similar lot machine-shorn. The records indicated that after two years fleeces of sheep shorn by machines had increased in weight over the hand-shorn fleeces to an extent, which in the author's opinion, can not be attributed entirely to closer shearing. Two years' records also showed heavier fleeces from folded than from plain-wool sheep, but the wool was longer in the latter fleeces.

A short statement of one year's results in raising Corriedales on the range is included.

Some experiences in breeding range sheep, F. R. MARSHALL (*Natl. Wool Grower, 8 (1918), No. 1, pp. 35–37; also in Amer. Sheep Breeder, 38 (1918), No. 2, pp. 92, 93*).—Tables are presented showing the relation of fineness of wool in Rambouillet ewes to grease weight of fleece and length of wool, based on records secured by the Bureau of Animal Industry of the U. S. Department of Agriculture at Laramie, Wyo., in 1915 and 1916. It is also noted that the percentage of lambs produced was higher and the proportion stillborn or dead within a week lower in the case of the Lincoln×Merino crossbreds than in the case of pure bred Rambouillets and Corriedales.

Results of experiments with crossbred range sheep, F. R. MARSHALL (*Natl. Wool Grower, 10 (1920), No. 1, pp. 17–19*).—Results secured by the Bureau of Animal Industry of the U. S. Department of Agriculture since the transfer of the sheep experiments to Dubois, Idaho, in 1917, are summarized.

The F_3 generation of the Lincoln×Rambouillet cross form a desirable and fairly uniform strain for which the name Columbia is proposed. Each generation is mated inter se. It is thought that after a few more generations the Columbias will be entitled to consideration as a distinct breed.

Sheep and wool for farmers.—Cross-breeding experiments.—The wool and mutton type, J. W. MATHEWS (*Agr. Gaz. N. S. Wales, 29 (1918), No. 7, pp. 480–490, figs. 3; 30 (1919), Nos. 2, pp. 99–110, figs. 3; 3, pp. 169–175, fig. 1; 6, pp. 406–421, pls. 4; 12, pp. 837–847*).—These articles are the final installments of a report on crossing experiments between imported British long wool rams and Australian Merino ewes. The data secured at the Bathurst Experiment Farm are given in detail and the previously reported results at the Wagga Farm[1] and the Cowra Farm (E. S. R., 37, p. 770) are summarized, some additional observations being recorded.

The experiments were begun in 1909 and 1910 and the actual crossing lasted five years on each farm. It was planned to keep as many as possible of the ewe lambs under observation for at least five years. The rams used were Lincolns, Leicesters, and Border Leicesters. A large number of tables are included showing the weight of fleece, fineness of wool, body weight, girth (in some cases), carcass weight and other slaughtering data, etc., of the three classes of crossbreds at different ages.

"The Lincoln furnished, on the whole, the cross most regular in outline—a character that became more marked as the sheep advanced with age. The progeny of the Leicester, though square, was fairly short of body, but with particularly well-rounded hindquarters; a marked deficiency, however, was the comparative narrowness of the forequarters, and the shortness of the brisket. The Border Leicester produced a broad, long-bodied sheep, fairly equal in conformation, high on the leg, and with full hams, deep shoulders, broad loins, well-rounded girth, prominent brisket, and capacious chest, as the dimensions given in tables showing waist girth measurements indicate. So far as first crosses go, the Border Leicester undeniably furnished the most suitable class of carcass for export." This cross was also distinctly heavier than the others at practically all ages. The Lincoln crosses produced the heaviest fleeces, but they were coarser and more variable in quality than the others and sold for less money than those of the Border Leicester cross.

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[1] Gaz. N. S. Wales, 25 (1914), Nos. 2, pp. 93–105; 6, pp. 461–469; 7, pp. 553–569, pls. 3; 8, pp. 645–651, pl. 1.

The empire's trade in wool in its relation to the wool trade of the world, A. S. Judge (*Bul. Imp. Inst.* [*London*], *16* (*1918*), *No. 4*, *pp. 476–515*).—This article presents estimates of the amount of wool produced by each of the important sheep-raising countries of the world, and statistical summaries of the international trade in wool and woolen manufacture, with particular regard to the trade of the British Empire.

[Hog feeding experiments], G. S. Templeton (*Alabama Col. Sta. Rpt. 1919, pp. 28–30*).—Brief notes on three hog feeding trials are presented.

To study the influence of peanuts in the ration on the quality of the lard, 5 lots of 5 hogs each and 1 of 3 hogs were fed for 107 days beginning December 28, 1918. Three rations produced firm carcasses, viz, the check ration corn and tankage (8:1); corn and peanut meal (7:1); and corn and oil-free peanut meal (2:1). The average melting points of the lard were, respectively, 40.3, 39.9, and 42.4° C. Some of the carcasses of the lot fed corn and ordinary peanut meal (2:1) dressed out firm and the others were medium soft; the average melting point of the lard was 40.5°. The carcasses of the lot fed corn and peanut meal (1:1) were classified as medium soft (lard melting at 39.7°), while the sixth lot (3 hogs) fed exclusively on whole peanuts were very oily, the lard being semifluid.

An acre of peanuts was hogged-down by 5 hogs in 38 days. The hogs were then put in dry lot and finished on corn and tankage. An acre of corn and soy beans (alternate rows) furnished grazing for a comparable group of 7 hogs for 64 days. Both lots were marketed at the same time and were satisfactory to the packer, bringing top prices. The hogs finished in the dry lot were somewhat firmer.

A fish meal containing 56.56 per cent protein and 6.89 per cent oil made from menhaden, was fed with corn in the proportion 1:6 to four 63.5-lb. Poland China gilts for 127 days. Four litter mates (gilts) were fed tankage (protein 36.19, fat 21.68 per cent) and corn 1:6, for the same period. The fish meal lot made an average daily gain of 1.37 lbs. per head and required 3.73 lbs. of feed per pound of gain. The check lot gained at the rate of 1.27 lbs. per day and consumed 4.04 lbs. of feed per pound of gain. The menhaden meal, which was furnished by the U. S. Department of Agriculture, proved to be a palatable feed.

[Swine feeding experiments at the California Station] (*California Sta. Rpt. 1919, pp. 77, 78–80*).—Conclusions drawn from swine feeding tests conducted by J. T. Thompson, E. C. Voorhies, and C. M. Vestal are stated but no details of the experimental procedure are given.

A lot of pigs fed grain on alfalfa pasture from weaning were compared with another lot on alfalfa pasture without grain throughout the grazing season and then finished on grain. "The first lot reached market weight in approximately one-half the time required by the others. They were on pasture only 42 days, compared with 258 days for the second lot, and when ready for market had consumed less grain." Alfalfa cut green and fed in the dry lot produced slower gains than alfalfa pasture, but not as large an area of alfalfa was required. With the cut alfalfa more grain was used per unit of gain.

As to concentrates for fattening pigs, milo maize in one trial was found about 10 per cent more efficient than barley, but in a second trial the latter was 10 per cent the more efficient. Two trials are held to indicate that unskimmed whey has about 60 per cent of the feeding value of skim milk. Another trial seemed to show that 16 lbs. of skim milk was equal to a pound of tankage or fish meal.

Household garbage collected in Oakland during the last half of 1917 was fed to hogs and a gain of 75.6 lbs. per ton of garbage was secured.

Swine feeding experiment, W. Dietrich (*Minnesota Sta., Rpt. Crookston Substa., 1917–18, pp. 83, 84*).—Inconclusive results are reported from an experimental attempt to induce changes in the offspring by excessive protein feeding. A group of pigs receiving a normal protein ration (0.5 lb. per day) were fed corn, oats, and tankage, while another group on a high protein plane (0.9 lb.) had skim milk in addition. In the first year the offspring of matings high×high averaged about the same weight at the age of ten months as those of normal×normal but in the second year they were lighter.

Winter rations for brood sows, W. L. Robison (*Mo. Bul. Ohio Sta., 4 (1919), No. 12, pp. 363–368, figs. 2*).—Three experiments are reported involving comparisons of supplements to corn and legume hay as winter rations for pregnant sows. They were begun in December, 1915, January, 1918, and January, 1919, respectively, and each sow was continued on the experimental rations until she farrowed. The combined results (including those from two lots, one fed tankage, the other skim milk, not reported in detail) are summarized as follows:

Comparison of supplements to rations for brood sows.

Supplement.	Number of sows.	Daily ration.			Weight per sow.		Daily gain per sow.	Pig per litter.	Average birth weight per pig.	Daily cost of ration.	
		Ground corn.	Supplement.	Legume hay.	Initial.	Final.				Gross.	Net.[1]
		Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*		*Lbs.*	*Cts.*	*Cts.*
None	11	4.02	....	2.55	398.7	450.0	0.60	12.6	2.27	12.6	9.2
Tankage	37	3.75	0.31	2.55	391.9	457.4	.84	11.9	2.24	13.6	7.3
Linseed meal	7	5.24	.37	1.53	398.9	479.8	.87	10.2	2.45	16.1	8.4
Skim milk	15	4.23	10.14	1.87	405.6	496.2	1.22	11.0	2.31	18.5	7.3
Oats	7	2.47	2.47	1.54	437.7	504.7	.85	11.6	2.29	13.3	7.0

[1] Gross cost less value of daily gains at 12 cts. a pound.

Corn was charged at 2.5 and oats at 2.25 cts. a pound, skim milk at 60 cts. per 100 lbs., and linseed meal at $80, tankage at $110, and hay at $20 a ton.

The author holds that sows should gain in body weight during gestation, and points out that seemingly expensive rations may in reality be cheap if credit is given for gains. It is also noted that oats when low in price with respect to corn may be used as a partial substitute for the latter.

Poultry [experiments at the California Station] (*California Sta. Rpt. 1919, pp. 80–82*).—In connection with a brief mention of an investigation by J. E. Dougherty of the influence of artificial lighting on egg production during winter months, it is noted that birds in pens lighted both before sunrise and after sunset each day went through a heavy molt in the spring, and that those illuminated only at the end of the day molted lightly, while those exposed in the morning hours alone did not undergo a molt.

Feeding tests by W. E. Lloyd, not reported in detail, are held to indicate that rice bran when sweet and free from hulls is a satisfactory partial substitute for wheat bran in the mash. Paddy rice may be used as one-third of the grain ration of adult fowls without injurious effect from the gritty hulls. Rice polish makes a satisfactory substitute for ground barley.

It is also reported that wheat infected with stinking smut is not injurious to hens when fed with a good mash.

Poultry rations and methods of feeding, H. R. Lewis (*New Jersey Stas. Hints to Poultrymen, 8 (1920), No. 5, pp. 4*).—The feeding of brooder chicks, range chicks, and laying hens, the finishing of pullets for slaughter, and the place of Epsom salts in the poultry ration are treated briefly.

Methods of feeding laying hens, W. J. Buss (*Mo. Bul. Ohio Sta., 5 (1920), No. 1, pp. 29–32*).—The experimental data recorded were reported in greater detail in Ohio Station Bulletin 322 (E. S. R., 39, p. 275).

"Contrary to general opinion, the failure to induce exercise by feeding the grain in the litter did not seem to have a detrimental effect upon the health of the fowls. In matter of cleanliness, feeding in the trough has much to commend it. There is always more or less filth in the litter, even though the litter is changed frequently, and some of this is picked up with the grain when fed in the litter."

The bearing of ratios on theories of the inheritance of winter egg production, H. D. Goodale and G. MacMullen (*Jour. Expt. Zool., 28 (1919), No. 1, pp. 83–124*).—Winter egg records of Rhode Island Red pullets and their parents at the Massachusetts Experiment Station are tabulated in two ways, (1) by a scheme—requiring three classes of birds, high (30 or more eggs before March 1), medium (1 to 29 eggs), and zero producers—to test Pearl's theory (E. S. R., 28, p. 576) that egg production is determined by two hereditary factors, one sex-linked and the other not, and (2) on the basis of a simpler theory—requiring two classes, high (30 or more eggs) and low (0 to 29 eggs) producers—that two ordinary (not sex-linked) factors are concerned, two dominant genes being necessary for high production. The observed ratios agreed fairly well with those expected by both theories, but it is thought that the "fit" was better in the case of the second. Similar results were obtained from some records of Cornish Indian Game crosses, and it was found that Pearl's data could be adequately described by the ratios called for on the second theory.

It is concluded, therefore, that a sex-linked factor concerned with the number of eggs laid in the winter has not been demonstrated, and that the "too great ease" with which observations can be fitted to theory renders unprofitable any further study of the inheritance of egg production by classifying pullets according to egg records alone. The study of the rate of production and the conditions modifying it, as outlined by Goodale in a paper previously noted (E. S. R., 41, p. 179), is deemed a more promising method of approaching the problem.

Practical results from studies on egg production, H. D. Goodale (*Massachusetts Sta. Bul. 191 (1919), pp. 97–104, fig. 1*).—This bulletin consists of three short notes, the first of a projected series dealing with practical results of the poultry breeding experiments conducted at the station.

I. *Inbreeding* (pp. 97–102).—Cases are cited of high and of low egg records of inbred pullets, and the conclusion is drawn that inbreeding must be used with caution. "Very likely the best way to renew the commercial egg flock is through the crossing of strong, high-producing, inbred lines, which will, of course, be maintained intact by inbreeding, and making the cross anew each season."

II. *Is the influence of the male or of the female the more important?* (pp. 102, 103).—In view of the doubtful foundation for the theory of the sex-linked inheritance of egg-laying capacities (as noted in the preceding abstract), it is pointed out that the dam is as important as the sire in determining the egg records of offspring.

III. *The exclusion of parasites* (pp. 103, 104).—The quarantine methods in use at the station's poultry plant are outlined.

Is the inheritance of egg production an insoluble problem? H. D. Goodale (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 5 (1919), No. 10, pp. 73, 74*).—Five difficulties encountered in the experimental study of egg production are briefly discussed, namely, securing stock of requisite purity, getting sufficient progeny from particular mated pairs, determining the productivity of males, maintaining uniformity in details of management, and keeping out disease. It is thought that an investigator can overcome the first four by patience and adequate facilities, but the author sees no hope of excluding obscure and unrecognized diseases, although rigorous quarantine may help.

"Unless the investigator can show that disease can be neglected, all supposed solutions of the problem must receive the closest scrutiny."

Improving mongrel farm flocks through selected standard-bred cockerels, W. A. Lippincott (*Kansas Sta. Bul. 223 (1920), pp. 3–48, figs. 30*).—The author reports on the egg records secured in a three-generation grading experiment with poultry.

The original stock of 40 mongrel pullets, purchased from a local firm of poultry packers, was divided into 4 equal-sized pens as nearly alike as possible in type, weight, and development, but without regard to color. The cockerels mated to the respective pens were a White Orpington, a Barred Plymouth Rock, a Single Comb White Leghorn—all three standard-bred—and a mongrel secured from the packing house. Laying records began November 1, 1913, and at the end of each year the pullets in a pen were replaced by 10 of their daughters, one from each dam as far as possible. "In the cases where there were no daughters, pullets from other females in the same pen were used. The basis of choice in such cases was vigor and similarity to the breed of their sires. The egg records of their dams were not consulted." Each pen of daughters were mated to a purchased cockerel of the same breed as their sires. "The standard-bred cockerels used throughout the experiment were purchased solely upon the representation of their breeders. In so far as could be ascertained by correspondence the birds chosen were as desirable from an egg-production standpoint as any to be secured at the time. They were purchased without previous inspection, and no means beyond the reach of any interested person was used in locating them."

The following table summarizes the egg records:

Egg production of mongrel pullets and of their descendants by standard-bred and mongrel cocks.

Pullet stock.	Eggs laid per pullet.				Relative egg production.			
	Leghorn crosses.	Plymouth Rock crosses.	Orpington crosses.	Ungraded mongrels.	Leghorn crosses.	Plymouth Rock crosses.	Orpington crosses.	Ungraded mongrels.
Mongrels	72.3	98.5	84.8	95.8	100	100	100	100
First generation	155.9	132.5	126.8	104.0	216	135	150	109
econd generation	188.6	149.6	105.8	145.2	261	152	125	152
Third generation	192.6	155.6	79.6	129.6	266	158	94	135

The relatively poor showing of the second and third Orpington crosses is ttributed to the chance selection of poor sires. One of the first Orpington male's daughters was the only first-generation grade to lay more than 200 eggs.

[Hens as eggs producers] (*Minnesota Sta. Rpt. 1919, p. 74*).—A three years' experiment at the Crookston substation to determine the value of retaining hens as layers beyond their pullet year is summarized. As pullets 25 birds averaged 114 eggs and as hens 107 eggs per year. Although the hens consumed somewhat less feed than the pullets they yielded a slightly lower profit.

Egg-laying tests at Hawkesbury Agricultural College, seventeenth year's results, 1918–19, E. F. Whitbread and J. Hadlington (*Agr. Gaz. N. S. Wales, 30 (1919), No. 5, pp. 337–360, figs. 11; also in Dept. Agr. N. S. Wales, Farmers' Bul. 123 (1919), pp. 26, figs. 11*).—This is a discussion of the New South Wales contest concluded March 31, 1919. Monthly individual egg records are tabulated of 420 pullets and 120 second-year hens. The production of the latter as pullets is also given. The report of the previous contest has been noted (E. S. R., 41, p. 370).

Report on the eighth Victorian egg-laying competitions, 1918–19, A. Hart (*Jour. Dept. Agr. Victoria, 17 (1919), No. 6, pp. 341–359, figs. 11*).—This is a report of the egg-laying contest held at Burnley, Victoria, during the year ended March 31, 1919. Individual records by months are tabulated for 82 White Leghorn, 40 Black Orpington, and 20 Rhode Island Red pullets, and group records by months for 100 pens of 6 birds each. Reports of preceding contests have been noted (E. S. R., 41, p. 371).

DAIRY FARMING—DAIRYING.

Dairy cattle [feeding experiments] (*California Sta. Rpt. 1919, pp. 72–76*).—Brief summaries of several feeding tests conducted by F. W. Woll and E. C. Voorhies are presented on these pages. Those not reported in previous publications are as follows:

In continuation of previous investigations of alfalfa hay as a sole feed for milch cows (E. S. R., 41, p. 371), it is noted that 3 third lactation records of alfalfa-fed cows have been secured and that the butter fat production was again lower than that of 3 corresponding lactations of the mixed-feed group used as controls. In a similar study of alfalfa *v.* alfalfa plus other succulent feeds, it was found that 8 heifers fed the latter averaged 14 per cent more milk and 15 per cent more fat than 6 heifers of similar type fed alfalfa alone.

In a comparison between whole and ground grain (oats and milo maize) as feed for young calves receiving in addition skim milk and alfalfa hay, the group given the ground mixture made the less rapid gain, but in a repetition with somewhat older calves the results were reversed. It is estimated that with ground grain 3.2 feed units and with whole grain 3.5 units produced a pound of gain (both tests combined). "Considering the cost of grinding small grains like milo [maize] and oats, it would appear, therefore, that there was no appreciable advantage found in grinding the grain for young dairy calves."

Oat hay and alfalfa hay were compared as feed for young calves in a test by the reversal method with 2 groups of skim milk calves whose grain ration consisted of dried beet pulp, barley, wheat bran, and coconut meal (3:2:2:1). The greater gains were made during alfalfa feeding.

A group of heifers and dry cows, receiving throughout limited amounts of alfalfa hay, were fed barley straw for 50 days and then changed to milo maize stalks. Although more of the latter was consumed per day, the gains of both cows and heifers were larger during the first period.

Cost of producing dairy products (*Minnesota Sta. Rpt. 1919, p. 42*).—Cost data for six cow test associations (1,635 cows) for the year ended July, 1918, are summarized. To produce 100 lbs. of milk required 17.3 lbs. of grain, 41.5 lbs. of roughage, 89 lbs. of silage, and 27 days of pasture The average annual production was 6,517 lbs. of milk and 251 lbs. of fat.

The variability of cows' milk, H. S. H. WARDLAW (*Proc. Linn. Soc. N. S, Wales, 42 (1917), pt. 4, pp. 815–865, figs. 6*).—The freezing-point depression, density, electrical conductivity, and chemical composition of samples of afternoon milk from 109 normal cows were studied.

Using the ratio of range to mean as the measure of variability, the author finds that depression of the freezing point and density were the least variable quantities measured. Of the chemical constituents, lactose was the least and fat the most variable. The percentages of fat and ash were greater in the milk of older cows, and that of protein less. The other determinations (physical and chemical) were not effected by age. As lactation progressed the percentage of lactose became slightly lower, but the electrical conductivity and the percentages of fat and of protein increased.

Protein in milk (*California Sta. Rpt. 1919, p. 76*).—It is reported that 60 samples of cows' milk from the San Francisco district, analyzed by M. E. Jaffa, averaged 3.26 per cent protein, and that 40 samples of goats' milk averaged 3.58 per cent.

The relation between the fat-content and the electrical conductivity of milk, H. S. H. WARDLAW (*Proc. Linn. Soc. N. S. Wales, 43 (1918), pt. 3, pp. 613–625*).—The author reports that the removal of fat from milk increases the electrical conductivity, the increase being directly proportional to the volume of fat removed.

A study of the electro-pure process of treating milk, A. K. ANDERSON and R. FINKELSTEIN (*Jour. Dairy Sci., 2 (1919), No. 5, pp. 374–406, figs. 2*).—Extensive bacteriological and chemical observations are recorded of milk subjected to an alternating current of 2,300 volts in a patented electric pasteurizing device installed at Camp Meade, Md. In operating the machine the milk, previously heated to 40° C. (104° F.), passes in rapid succession through four porcelain cups of 200 cc. capacity, in each of which it comes in contact with two electrodes and completes the circuit. The high resistance of the milk generates heat, so that at the end of the (approximately) 20 seconds required for the passage of a given particle of milk through the machine the temperature has been raised to 70° (158° F.).

When the preliminary heating of the milk was properly carried out, the machine was found to effect a satisfactory reduction in the bacterial count. The final product was at least equal to that designated grade B pasteurized milk by the New York city standard, and was often equal to grade A. Practically all the lactose-fermenting, endo-positive organisms were destroyed. The treated milk kept well at 5 to 10° for 5 days. The machine elevates the temperature of the milk about 30° irrespective of the initial temperature, and since in experimental runs the bacterial content was not reduced when the initial temperature was 25° it is concluded that the heat and not the electric current is the effective killing agent.

Treatment of milk at 70° did not interfere with the cream line but the time required for coagulation by rennin was decidedly increased. Little or no albumin was precipitated by the electrical treatment. Peroxidase was not destroyed, but the reductase of the milk was weakened.

A report from E. V. McCollum is included as to the vitamin content of the processed milk. Since the milk cured polyneuritis in the young rat and butter fat from the milk cured xerophthalmia in the same animal, it is concluded that the electrical treatment has no effect on the vitamins present.

Observations on the toxic properties of heated and decomposed milk and of milk cultures of Bacterium welchii (Bacillus ærogenes capsulatus), W. W. FORD (*Amer. Jour. Diseases Children, 18 (1919), No. 3, pp. 199–206*).—Milk heated to 80 or 85° C. (176 to 185° F.) for 20 to 30 minutes and then allowed to decompose at 37° was found to contain bacteria and bacterial products which caused acute death in guinea pigs and rabbits inoculated subcutaneously. Berkefeld filtrates were also toxic. The same or at least similar products were secured from milk cultures of the common gas gangrene organism (*B. welchii*), which the author and his collaborator Pryor (E. S. R., 32, pp. 268, 269) have found of constant occurrence in market milk.

"The demonstration of such materials in heated milk should be kept clearly in mind in the consideration of the problem of milk pasteurization; and, under all circumstances, milk heated to temperatures sufficient to destroy vegetative bacteria but not their spores should be kept at a low temperature to prevent the development of these spores and should be used within a brief interval after the heating."

Sterilization of bottles for pasteurized milk, M. B. Hopkins and M. L. Kelly (*Amer. Jour. Pub. Health, 9* (*1919*), *No. 3, pp. 183, 184*).—Counts of bacteria in supposedly sterilized milk bottles from 23 milk plants are reported to show both the difficulties and the importance of enforcing a municipal ordinance requiring that all containers used for milk in Baltimore be sterilized.

Keeping quality [and flavor] of butter (*Minnesota Sta. Rpt. 1919, pp. 44, 45*).—It is stated that experimental work has been carried out which indicates (1) that butter made from cream pasteurized at 175° F. (enzyms destroyed) keeps better than butter made from the same cream heated to the usual temperature of 145° (enzyms still active), and (2) that working a small amount of starter into the butter in the churn produces a better flavor than the old practice of ripening the cream in the vat.

Pickling of butter (*California Sta. Rpt. 1919, p. 77*).—It is stated that S. L. Denning found butter in good condition after eight months' storage in a 20 per cent solution of sodium chlorid at 50° F. The butter had been cut into 2-lb. "squares" and wrapped in parchment paper before the brine was added.

[Cheese making experiments at the California Station] (*California Sta. Rpt. 1919, pp. 76, 77*).—The following statements concerning the use and bacterial composition of starters are made, based mainly on observations by H. S. Baird: (1) The use of a lactic starter containing *Bacillus bulgaricus* produces a buttermilk cheese of good quality, (2) pasteurized milk ripened with *B. bulgaricus* yields a "fairly satisfactory" Cheddar cheese, and (3) a pure culture of *B. bulgaricus* used as a starter is more effective than a *Streptococcus lacticus* (*B. lactis acidi*) culture in controlling gassy fermentations in California (granular curd) cheese, but the cheese is not uniform in flavor.

In a note on rennet substitutes in making California cheese it is stated that the use of pepsin and curdalac causes corkiness. The cheese "contains about the same percentage of moisture as rennet cheese, but has a dry appearance and feeling. This defect seems to be caused by a lack of acid. Pepsin requires the presence of acid, and since California (granular) cheese is a sweet-curd cheese, the necessary acid is not developed. Pepsin is more dependent upon the presence of acid for coagulating milk than rennet. A mixture of one-half rennet and one-half pepsin gives satisfactory results."

The mold of the blue-veined cheeses, D. W. Steuart (*Jour. Dairy Sci., 2* (*1919*), *No. 5, pp. 407–414, figs. 4*).—Using Thom's cultural methods (E. S. R., 22, p. 531) the author found that *Penicillium roqueforti* is the characteristic Penicillium in typically-veined Roquefort, Gorgonzola, Stilton, and blue Caerphilly cheeses made in Wales, and reports a very successful use of pure cultures of this mold at University College, Cardiff, in the manufacture of Stilton, Wensleydale, imitation Roquefort, and single-curd blue Caerphilly cheeses. The degree of acidity developed in the curd appeared to be without influence on the success of the inoculation.

It is suggested that *Oïdium lactis* plays an important part in the formation of the crinkled coat of Stilton cheeses.

On the fungus flora of Brie cheese, A. LOUBIÈRE (*Compt. Rend. Acad. Sci. [Paris], 170 (1920), No. 6, pp. 336–339, figs. 2*).—The author records the occurrence of *Fusarium sarcochroum*, *Geotrichum candidum*, and *Trichosporium* sp. on ordinary specimens of Brie cheese, in addition to the familiar Penicillium. On specimens that had become dried in the curing cellar he found *Hormodendron cladosporioides*, *Gymnoascus luteus*, and *Lasiobotrys* sp. Developmental stages of Trichosporium and Hormodendron are described and illustrated.

Camembert cheese, G. FILAUDEAU (*Ann. Falsif., 11 (1918), No. 113–114, pp. 71–76*).—The moisture, fat, and salt contents of 40 Camembert cheeses are tabulated, together with the dimensions and prices.

The book of ice cream, W. W. FISK (*New York: The Macmillan Co., 1919, pp. XVIII+302, figs. 88*).—The manufacture of ice cream on a commercial scale is the subject of this manual. The topics discussed include the classification of ice cream, the milk products and other ingredients of the mix, the equipment used, refrigerating systems, the freezing and hardening processes, judging and testing the finished product (including the use of the Mojonnier testers), bacteria in relation to ice cream, marketing problems, arrangement of the factory, and history of the ice cream industry.

VETERINARY MEDICINE.

Report of the twenty-first annual meeting of the United States Live Stock Sanitary Association, 1917 (*Rpt. U. S. Live Stock Sanit. Assoc., 21 (1917), pp. VIII+158*).—Among the papers presented at the twenty-first annual meeting of the association held in Chicago, December 3–5, 1917, are the following: The Eradication of Tuberculosis from Cattle and Swine, by J. A. Kiernan (pp. 10–20) (E. S. R., 38, p. 686); Bovine Tuberculosis, by E. Z. Russell (pp. 20–26); Plan for Branding Accredited Herds, by W. J. Fritz (pp. 26–55); Report on Contagious Abortion Disease, W. Giltner, B. B. Flowe, and G. M. Potter (pp. 56–77); Necrobacillosis, by W. L. Boyd (pp. 78–83); Recent Studies on the Modes of Transmission of Hog Cholera, by M. Dorset (pp. 84–91); Hog Cholera Control, by J. W. Connaway (pp. 91–108); Blackleg and Its Prevention, by G. A. Johnson (pp. 110–120) (E. S. R., 39, p. 188); Cleaning and Disinfection of Stock Cars, by J. H. Mercer (pp. 122–128); etc.

The report of the twenty-second annual meeting of the association has been noted (E. S. R., 41, p. 777).

Report of the twenty-third annual meeting of the United States Live Stock Sanitary Association, 1919 (*Rpt. U. S. Live Stock Sanit. Assoc., 23 (1919), pp. 292, figs. 2*).—The papers presented at the twenty-third annual meeting of the association, held in Chicago, December 1–3, 1919, are as follows: Tuberculosis and the Beef Industry, F. W. Harding (pp. 31–37); Tuberculosis and the Dairy Industry, by J. M. Hackney (pp. 38–44); Report of Progress in Tuberculosis Control, by J. A. Kiernan (pp. 44–55) (E. S. R., 42, p. 477); Safe and Practical Regulations for Handling Feeder Hogs, by W. W. Wright (pp. 55–66); Regulations for Interstate Shipment of Swine in Crates, by W. J. Carmichael (pp. 67–74); Report of Progress in Hog Cholera Control, by U. G. Houck (pp. 74–84) (E. S. R., 42, p. 679); Differential Diagnosis of Infectious Swine Diseases, by A. T. Kinsley, W. W. Dimock, and W. E. King (pp. 84–88) (E. S. R., 42, p. 381); *Bacillus coli communis*, by W. W. Dimock (pp. 88–93); Comparing Swine Plague to Hog Cholera, by R. Jay (pp. 97–102); State Laws Affecting the Serum Industry, by E. M. Boddington (pp. 103–109); How Shall We Name Bovine Abortion Disease, including a report of a committee on infectious abortion, by W. Giltner (pp. 115–124); Memorandum Relative to the Etiology of So-called Infectious Abortion Disease of Cattle, by E. C. Schroeder (pp. 125–132) (E. S. R., 42, p. 677); The Nature of Abortion, by W. L. Williams (pp. 133–156); Sequelæ of Abortion Bacilli Infection of the Bovine Uterus, by E. T. Hallman (pp. 156–160); Abortion Disease and Its Control, by J. F. DeVine (pp. 160–182), noted on page 881; Changes in the Live Stock Industry, by F. R. Marshall (pp. 195–202); Hemorrhagic Septicemia in Sheep, by I. E. Newsom (pp. 203–222); Sanitation and Live Stock Transportation, by A. F. Stryker (pp. 222–237); etc.

Proceedings of the Wisconsin Veterinary Medical Association, 1919, edited by F. B. Hadley (*Proc. Wis. Vet. Med. Assoc., 4 (1919), pp. 128, pl. 1, figs. 14*).—Among the papers presented at the fourth annual meeting of the association, held at Madison, January 14–16, 1919, are the following: Hairless Pigs, by E. B. Hart (pp. 32–36); Swine Plague, by L. G. Hart, jr. (pp. 36–39); The Hog Cholera Situation in Wisconsin, by J. T. Purcell (pp. 47–49); The Outlook for the Veterinarian in the Philippines, by G. Van Agustin (pp. 50–54); Hemorrhagic Septicemia, by W. L. Richards (pp. 54–57); A New Vaccine against Contagious Abortion, by F. B. Hadley (pp. 57–61); Report of the State Detention Farm for Tuberculous Cattle, by O. H. Eliason and J. P. West (pp. 61–68); Bots in Horses, by S. B. Fracker (pp. 69–72); Necrobacillosis in Pigs, by J. B. Collins (pp. 72–74); and A Few Cases of Traumatic Pericarditis in Cows, by H. Lothe (pp. 75–81).

A text-book upon the pathogenic bacteria and protozoa, J. McFarland (*Philadelphia and London: W. B. Saunders Co., 1919, 9. ed., rev., pp. 858, pls. 3, figs. 330*).—This is a revised edition of the work previously noted (E. S. R., 36, p. 177).

Source and significance of streptococci in market milk, F. S. Jones (*Jour. Expt. Med., 31 (1920), No. 4, pp. 347–361*).—"The principal source of streptococci in milk is the cow's udder. The udder streptococci fall into two broad groups; those of the larger group agree in cultural characters and agglutination affinities with mastitis streptococci; the smaller group is composed of low acid-producing streptococci. The streptococci of the latter group produce clear zones of hemolysis about surface and deep colonies in horse blood agar plates. They attack dextrose, lactose, saccharose, and maltose, but do not ferment raffinose, inulin, mannite, or salicin. Acid production in dextrose by the members of this group is about the same as that produced by human streptococci under the same conditions. The limiting hydrogen-ion concentration for these pleomorphic udder streptococci in dextrose serum bouillon is within the limits of the limiting hydrogen-ion concentration observed by Avery and Cullen for human streptococci.

"All the streptococci from the vagina, saliva, skin, and feces have been nonhemolytic. Those from the saliva form a heterogeneous aggregation in which individuals fermenting raffinose, inulin, and mannite predominate. From the skin a characteristic streptococcus has been found. It produces acid in dextrose, lactose, saccharose, maltose, raffinose, mannite, and salicin, but fails to acidulate media containing inulin. The fecal streptococci are characterized by the formation of large amounts of acid in dextrose, lactose, saccharose, maltose, raffinose, inulin, and salicin. Mannite is not fermented. Neither the fecal nor the skin streptococci have been isolated from the bottled milk with any great frequency."

Tumors: Their nature and causation, W. D'Este Emery (*New York: Paul B. Hoeber, 1918, pp. XX+146*).—The several chapters of this work discuss the primary postulates for the parasitic hypothesis and their justification, the natural history of tumors considered in the light of these hypotheses, some histological considerations, further considerations derived from the life history of tumors, the experimental grafting of tumors and its bearing on the question, difficulties (real and imaginary), some other theories, and some analogies from plant pathology.

Surgical and obstetrical operations, W. L. WILLIAMS (*Ithaca, N. Y.: Author, 1919, 4. ed., rev., pp. X+196, figs. 74*).—This fourth edition, prepared with the collaboration of J. N. Frost, of the work previously noted (E. S. R., 27, p. 475) is designed primarily for the use of students in laboratory surgery and embryotomy, but will be found of value to the practitioner.

Poisonous plants, O. A. BEATH (*Proc. Soc. Prom. Agr. Sci., 39 (1919), pp. 39–47*).—Brief accounts are included on loco, larkspurs, lupines, death camus, water hemlock, aconites, vetches, laurels, woody aster, western sneezeweed, wild cherry, milkweed, oak, and ferns. Methods of control and economic considerations are briefly dealt with.

A new sheep poisoning plant of the Southern States, C. D. MARSH (*U. S. Dept. Agr., Dept. Circ. 82 (1920), pp. 3, fig. 1*).—*Daubentonia longifolia*, in some sections popularly known as coffee bean, has been called to the attention of this Department within the last two years as likely to be of great importance as a cause of stock poisoning. It is a shrub or small tree belonging to the pea family which grows in the Gulf region and in Texas, extending as far north as the northeastern border of that State. While all the known cases of poisoning have been of sheep and goats, it is thought probable that under suitable conditions cattle also would be affected.

In light cases the main symptom is depression, generally accompanied with diarrhea. When animals are fatally poisoned there are no pronounced symptoms, but the animals become weak, the breathing is labored, and they die with very little struggling. So far as known the danger from the plants is entirely from the seeds, and the cases of poisoning occur in the winter in areas where feed is scanty. A little more than 1 oz. of seeds may poison a sheep, and it may be killed by less than 2 ozs. It is said that little can be done in the way of remedies, and that the main reliance must be in prevention.

An inquiry into the causes for variation in determinations of disinfecting value, B. FANTUS and F. RUMBY (*Jour. Infect. Diseases, 26 (1920), No. 4, pp. 351–354*).—In an attempt to find out the reason for discrepancies in the results of experiments for determining the disinfecting value of chemicals by the growth of bacteria in solutions containing the disinfectant, a study was made of the effect of variations in the number of organisms added to the solution and of the presence of clumps of the bacteria on the resulting values. A 24-hour typhoid culture was used as the source of the bacteria and N citric acid solution as the disinfectant.

"Within the limits of the observations made, neither variations in the numbers of bacteria nor the presence of clumps are the determining factors for variations in results in observations on disinfecting time. . . .

"To command confidence in results in experiments of this kind, a much larger number of observations is required than are usually made; the average might then be noted, and only large differences in disinfection time considered conclusive evidence of difference between different agents."

The influence of thorium X on antibody formation, L. HEKTOEN and H. J. CORPER (*Jour. Infect. Diseases, 26 (1920), No. 4, pp. 330–335*).—Observations on the liberation of antibodies in rabbits under the influence of varying doses of thorium X are reported in a series of experiments in which thorium X was injected before, at the same time, and after the injection of the antigen, and the lysin, precipitin, and leucocyte content of the blood subsequently measured.

The antigen used was sheep's blood injected intraperitoneally in one dose of 25 cc.

It was found that in rabbits treated with thorium X in the early stages of antibody production the amount of precipitin in the blood might be reduced even when there was no definite reduction in the leucocytes in the peripheral blood. When the precipitin production was well under way, thorium X appeared to have no effect on the amount of precipitin in the blood. This is thought to indicate that thorium X may act on the mechanism of production rather than on the precipitin itself. It was uncertain whether any definite effect was exercised on the formation of lysin. It is pointed out that in this respect thorium X differs from benzene, which has been found by Hektoen (E. S. R., 35, p. 781) to restrain the output of lysin as well as precipitin.

"It is noteworthy also that thorium X, like benzene and the Roentgen rays, seems to be without effect on the antibody content of the blood when introduced near the height of the curve; but that unlike the other two agents, it causes leucopenia as promptly at this time as earlier. Further and more diversified experiments are required to determine whether these are constant and fundamental differences in the actions of agents which disturb in some way the production of antibodies at the same time they destroy leucocytes, marrow, and lymphoid cells."

Streptolysin, P. H. de Kruif and P. M. Ireland (*Jour. Infect. Diseases, 26 (1920), No. 4, pp. 285–329, figs. 10*).—The first part of this work consists of an investigation of hemolysin production by several strains of beta streptococcus in a standard broth to which various concentrations of blood sera of different species were added.

The data obtained in this study were used in the synthesis of a new blood-agar plate of maximal differentiating power. The amount of free hemolysin present at different periods of incubation was determined by the titration against constant quantities of washed blood cells of the supernatant fluid obtained by centrifuging the serum broth cultures at high speed (8,000 r. p. m.).

Lysin production was found to reach its maximum for the strains studied in from 7 to 8 hours when young (8 to 12 hour) cultures were used, and in a somewhat longer time with older cultures. When the logarithmic growth period of the culture ceased the free lysin began to decrease rapidly, often disappearing completely in 14 hours. Whole cultures were hemolytically active in low titer after the streptolysin had disappeared completely from the supernatant liquid.

Heated sera were in general superior to unheated for hemolysin production. Sheep and horse serum were superior in all concentrations to human, and decidedly superior to rabbit serum broth. All of the sera rose sharply from comparatively low titers in 5 per cent concentration to maximum values at 20 per cent for horse, sheep, and human serum to 25 per cent for rabbit.

The new blood-agar plate devised as a result of this study is made by combining 4 parts of heated sheep blood serum with one part of red blood cells. One part of this mixture is then combined with 3 parts of liquid agar, which makes the final concentration 20 per cent of serum, 5 of cells, and 75 of agar.

"The proposed medium is not only a very suitable one for demonstration of the hemolytic zones of beta streptococcus, but is in addition very efficient in the demonstration of multiple concentric zones of green production and hemolysis for alpha streptococcus and pneumococcus."

Chemotherapeutic studies with ethylhydrocuprein and mercurophen in experimental pneumococcus meningitis in rabbits, J. A. Kolmer and G. Idzumi (*Jour. Infect. Diseases, 26 (1920), No. 4, pp. 355–372, figs. 4*).—This paper records the results of experiments in which the toxicity of ethylhydrocuprein hydrochlorid and mercurophen was determined by subthecal injection in rabbits, and the influence was studied of various dosages of these substances on the course of infections produced by the subthecal injection of virulent pneumococci.

"The subthecal injection of single doses of ethylhydrocuprein in amounts of 0.5 cc. of 1:500 and 1:1,000 solutions per kilogram of body weight had a distinct beneficial effect on the course of experimental meningitis in rabbits produced by a type 1 pneumococcus of moderate virulence, when administered not later than 4 to 6 hours after the injection of organisms; when given 24 hours after the pneumococci this effect was not apparent. With a meningitis produced by a more virulent culture of type 2 pneumococci, single doses of this drug had but slight or no effect on the duration of the lives of the experimental animals."

Mixtures of specific antipneumococcus serum and ethylhydrocuprein and of sodium oleate and ethylhydrocuprein gave no better results than the drug alone.

Single doses of mercurophen in amounts as large as 0.5 cc. of 1:1,000 solution per kilogram of body weight had no appreciable effect on the course of experimental meningitis.

The authors conclude that ethylhydrocuprein offers promising possibilities in the treatment of human pneumococcus meningitis, provided it can be injected subthecally early in the disease. The method of procedure in such cases is outlined briefly.

Abortion disease and its control, J. F. DeVine (*Rpt. U. S. Live Stock Sanit. Assoc., 23 (1919), pp. 160–182*).—In the course of this discussion, the author states that in work with 1,110 animals in 37 herds in which abortion first ran in some herds as high as 47 per cent he has kept down re-abortion to as low as no per cent in some herds and in no herd to exceed 7+ per cent. This has been accomplished through sanitation and the proper cleansing of the uterus after abortion and subsequent attention to the vagina.

"In one herd 47 per cent of the herd aborted in 1917, in 1918 there was 100 per cent conception, the carrying of calves to full term, and the physiological expulsion of the membranes after dropping normal living calves; while in several herds in the immediate neighborhood re-abortion would run from 11 to 33 per cent." The author has no evidence that the udders were not in all these cases free from *Bacillus abortus*, but concludes that they must have contained the organism, thus indicating that second abortions may not be due to reinfection of the uterus from the udder, as has been reported to be the case by some investigators.

[Blackleg culture filtrate] (*California Sta. Rpt. 1919, pp. 86, 87*).—Of 14 young cattle vaccinated by G. H. Hart with blackleg culture filtrate, 2 developed the disease after one vaccination. Both of these were under 6 months of age at the time of vaccination, while most of the animals were over 6 months of age. As in many parts of the State vaccination under 6 months of age is necessary to prevent losses, it is recommended that when blackleg culture filtrate is used all animals of susceptible age be vaccinated twice yearly, as has been the general practice with the old muscle vaccine.

Blackleg, H. Welch (*Montana Sta. Circ. 86 (1919), pp. 8, figs. 8*).—A popular summary of information.

Report on Johne's disease, B. B. Joshi (*Poona Agr. Col. Mag., 11 (1919–20), No. 2–3, pp. 85–89*).—This is a report of the occurrence of Johne's disease in buffaloes kept for dairy purposes and in dairy cows.

Observations on paratyphoid bacilli recently isolated from animals, R. S. Spray (*Jour. Infect. Diseases, 26 (1920), No. 4, pp. 340–346*).—This is a report of work at the Purdue Experiment Station. "An intimate study of the tissues of carcasses of several hundred swine dying of enteric disease has shown the predominating bacterial flora to be members of the paratyphoid-enteritidis group. Thirty-four out of 40 strains studied in detail were typical *B. suipestifers;* two were identical with human *B. paratyphosus* A; two were identical with human *B. paratyphosus* B; two were intermediate between *B. suipestifer* and *B. paratyphosus* B. *B. enteritidis* was not encountered at any time.

"No true representative of the paratyphoid-enteritidis group has been isolated from feces nor from the lumen of the intestine in a large number of attempts. This fact is very striking in view of the predominance of this group in the tissues.

"It has been possible in this work to confirm in all respects the reports of other workers on the value of arabinose, xylose, dulcite, inosit, lead acetate, agar, and glucose serum water as diagnostic media for the differentiation of the members of the paratyphoid-enteritidis group."

[Tuberculosis investigations] (*California Sta. Rpt. 1919, pp. 82–85*).—The progress report on tuberculosis investigations contains in addition to the previously noted reports by Hart and Traum on combined tuberculin tests (E. S. R., 36, p. 383), and by Traum on making cattle environments free from infective tuberculous material (E. S. R., 38, p. 380), brief summaries of work on the intradermal and complement fixation tests for tuberculosis.

The observation that the intradermal injection of tuberculin in doses commonly used in official testing gives rise to a thermal reaction similar to the one obtained by the subcutaneous method is thought to have practical application in that by one injection both a local reaction and a general reaction as indicated by rise in temperature are produced. It is stated that the San Francisco County Medical Milk Commission has adopted this method in place of the subcutaneous test for testing dairy cows to be used for producing certified milk. Attention is called to the fact that in some instances the local reaction following intradermal injection of tuberculin does not appear until after 48 hours. It is recommended that two observations be made, the first at 48 or 60 hours, and the second at 96 or 120 hours, or if only one observation can be made that it be made at 72 hours.

The complement fixation test has been applied by J. V. Cook and J. Traum to 244 cattle sera with the following results: "Of 46 cases of severe tuberculosis 43, or 93.5 per cent, gave positive results and 3, or 6.5 per cent, gave no fixation. Of 55 cattle with slight or moderately severe localized lesions, 10, or 18.18 per cent, gave positive results while 45, or 81.81 per cent, gave negative results. The sera from 129 cattle showing no tuberculous lesions on postmortem showed 12, or 9.3 per cent, positive, while 117 were negative. Seven of the tuberculous and 7 of the nontuberculous sera were anticomplementary and were not included in the above figures."

Serological studies on tuberculosis.—Second contribution: Further observations on complement fixation, S. A. Petroff (*Amer. Rev. Tuberculosis, 3 (1920), No. 11, pp. 683–697*).—This paper supplements an earlier contribution[1] by a further discussion of the different phases of the complement fixation reaction for tuberculosis and by a comparative study of different antigens for the reaction.

The antigens used are classified into four groups: (1) Tubercle bacilli, dead or living, intact or pulverized, suspended in saline solution; (2) filtrates of broth cultures of tubercle bacilli; (3) ether-alcohol extracts of tubercle bacilli or their derivatives; and (4) a group of minor importance, including those antigens which are extracts of various tuberculous organs. Chemically these may contain a large amount of lipins, or combinations of lipins and proteins, or may possibly be free from lipins.

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[1] Amer. Rev. Tuberculosis, 1 (1917), No. 1, p. 33.

To determine what fraction of the tubercle bacilli contains the necessary antigenic properties, preparations from tubercle bacilli were made which were considered to be apparently pure lipins, lecithin, kephalin, and sphyngomyelin; a mixture of proteins and phosphates, cuorin, and carnithin; and other antigens rich in tubercle bacillus proteins. When compared for antigenic value the lipins gave no reactions, the mixtures of lipo-proteins weak reactions, and the protein fractions good reactions, although not equivalent to the control consisting of the glycerin extract of the whole tubercle bacilli.

In conducting the reaction the primary incubation period of antigen-antibody-complement is considered to be of the utmost importance, the optimum time being two hours, after which further incubation is said to impair the reaction. The optimum temperature of the final reaction is placed at between 35 and 40° C. The mechanism of the reaction is discussed, but no new theory is advanced to explain the phenomenon.

In conclusion the author confirms his earlier statement that an absolute diagnosis of tuberculosis can not be made by complement fixation alone but that it is "only one of the many links in the tuberculosis diagnostic chain." In order to obtain reliable results the technique must be standardized and the test performed only by well-trained workers.

Sodium morrhuate in the treatment of tuberculosis, L. Rogers (*Indian Jour. Med. Research, Spec. Indian Sci. Cong. No., 1919, pp. 236–256*).—This is a more detailed description of the treatment previously noted (E. S. R., 42, p. 777), with clinical reports from a number of physicians.

Contribution to the study of bovine anaplasmosis, J. Lignières (*Bul. Soc. Path. Exot., 12 (1919), No. 9, pp. 641–651*).—The author gives a detailed report upon the experimental inoculation of several species of animals with *Anaplasma argentinum*. The investigations led him to conclude that the guinea pig, rabbit, pig, and horse are not susceptible to *A. argentinum*, but that the sheep and goat are receptive to it and remain infected for years. The passages from sheep to sheep and from goat to goat can be continued indefinitely. No symptoms of the affection appeared in the sheep or goat aside from an occasional rise of temperature of 1° C. lasting for a day or two about the thirtieth day, but the virus was active when injected into the bovine.

Malignant catarrhal fever, C. J. Marshall, T. E. Munce, M. F. Barnes, and F. Boerner (*Jour. Amer. Vet. Med. Assoc., 56 (1920), No. 6, pp. 570–580, fig. 1*).—This is a detailed report of an outbreak of this highly fatal disease that occurred in Chester County, Pa., and in which 31 of 61 animals in a herd succumbed.

Both medicinal and biological treatment failed to check or alter its course, although the premises were frequently cleaned and disinfected. It is thought that the disease is more prevalent than is generally supposed, and that had this outbreak occurred in a small herd with but few deaths the diagnosis would probably have been overlooked. Up to the present time there appears to be no known cause and no prevention or cure for the disease.

The Federal quarantine and the rising cost of conducting the cattle business in the tick-infested area, E. M. Nighbert (*Fla. Univ. Ext. Bul. 23 (1920), pp. 5–7*).

Diseases of sheep (*California Sta. Rpt. 1919, pp. 88–90*).—Investigations were made of preparturient paralysis, which attacks fat ewes several days before they are due to lamb. While the cause of the disease has not been definitely determined, lack of exercise and overfeeding of such animals are thought to be primarily responsible for the trouble. The affected ewes are dull, listless, and aimless in their movements, and in advanced stages there is loss of vision, staggering gait, or inability to rise. After 5 to 8 days of illness the animal usually dies. Prevention by avoiding conditions that make for the excessive deposition of fat is said to have been successful.

An investigation was made of an infection in bucks in which marked changes were found in the genito-urinary organs, the infection progressing to the point of pus formation and necrosis of soft tissues. In some cases the entire testicle, which is primarily affected, was destroyed. Cultures from the affected areas on blood agar developed an organism which proved to be *Bacillus pyogenes*. Upon injection into the testicle of a healthy animal it produced a slowly progressing inflammation accompanied by pus formation similar to the naturally infected cases. The treatment of affected animals is unsatisfactory.

Two serious outbreaks of necrobacillosis in baby lambs which caused the lambing percentage to drop to about 75 were investigated during the year. The infection which presumably enters through the navel caused death in from 24 to 72 hours after birth. It is characterized by the formation in the liver of multiple necrotic areas of a grayish-yellow color, varying in size from a match head to a pea. Some cases also showed gastric infection. Cleaner lambing quarters with disinfection of the navel at birth with iodin were recommended and resulted in an appreciable cessation of deaths.

Field investigations of hemorrhagic septicemia in sheep, together with specimens and letters received, are said to indicate that this disease is much more prevalent than has been commonly supposed. It occurs in acute and chronic forms and is characterized by occurring sporadically and with a variable mortality in different flocks. In the acute form there is high temperature, loss of appetite, shivering, prostration, and early death, while in the chronic form the symptoms are milder, with little elevation of temperature. In two of the three outbreaks investigated during the year a vaccine made from *B. ovisepticus* and administered subcutaneously gave excellent results. In one herd of 300 out of which 15 head had died over a period of three weeks no further loss was sustained at four weeks.

[Hog cholera immunization] (*California Sta. Rpt. 1919, pp. 87, 88*).—Garbage-fed pigs aged 6 to 7 months, which had been vaccinated by the simultaneous method just before weaning, were subjected by P. T. Petersen to severe infection by injection with large amounts of virus. Absolute immunity was shown in 985 out of the 1,000 pigs tested. No losses from hog cholera occurred in 15,000 garbage-fed pigs, offsprings of immune sows which were vaccinated just after weaning and observed until sent to market. Unvaccinated check pigs under the same conditions contracted cholera. The successful immunization of garbage-fed hogs is thought to make possible the improvement of garbage-fed strains by the use of purebred boars, a practice hitherto impracticable on account of the susceptibility of the better type of hogs to cholera.

The desirability of a cell-free hog cholera serum is pointed out, and a centrifuge which has been found to clear the serum in a satisfactory manner is described. "This is called a vertical, direct-connected, bucket-type centrifuge. Th motor is 10 h. p. and gives a speed of 3,600 r. p. m. to 4 steel cups having a capacity of 800 cc. each. The precipitating force is 3,000 lbs. Full speed for 10 minutes will throw down the red cells and other débris in the form of a clot, leaving the serum a semitransparent pink fluid."

The loss in volume of the serum due to the removal of the red corpuscles is replaced by the addition of physiological salt solution containing 0.5 per cent of phenol.

Bacteriologic studies of a peracute disease of horses and mules, R. Graham, F. H. K. Reynolds, and J. F. Hill (*Jour. Amer. Vet. Med. Assoc.*, 56

(1920), Nos. 4, pp. 378–393; 5, pp. 489–507; 6, pp. 586–599, fig. 1).—This is a detailed report of a preliminary bacteriological study of a fatal equine disease, which has led to the following conclusions:

"In the absence of more conclusive evidence it can not be claimed that *Bacillus enteritidis* is the prime and specific cause of the disease in question. Yet it appears that this organism and possibly certain strains of B. paratyphoid B are closely related to the bacteriology of this disease. The symptoms-complex of the animals experimentally fed *B. enteritidis* isolated from the spontaneous cases are identical with those displayed by animals suffering from a spontaneous attack. *B. enteritidis* was isolated from approximately 22 per cent of the spontaneous cases under observation.

"Experimental animals not fasted to induce fatigue were not susceptible to *B. enteritidis* infection by feeding. *B. enteritidis* proved fatal to experimental mules which were fasted and subjected to conditions inducing fatigue, as incurred incident to shipment. *B. enteritidis* could not always be demonstrated in the heart blood, even following death in experimental animals by artificial infection, suggesting that the type of the disease induced is probably a toxemia per se. Complement-fixing bodies or agglutinins could not be demonstrated in the blood of all sporadic cases, and negative results to the above serological tests were likewise obtained in experimental mules artificially infected. Feeding avirulent cultures, as well as inoculating killed cultures subcutaneously and intravenously and live cultures subcutaneously, appeared to have produced a degree of immunity. Yet the value of immune serum, as well as bacterins, in establishing an artificial immunity was not satisfactorily or completely demonstrated. Some limited experimental evidence is indicative of their value.

"*B. enteritidis* appears to lead a somewhat saprophytic existence and to possess a capricious pathogenesis. It is possible that some animals possess a degree of immunity or resistance against this organism.

"Paratyphoid organisms were encountered in cultures from extraneous sources, though their pathogenic significance was not completely determined. The isolation of *B. enteritidis* from equine feces of a healthy animal is suggestive of the relation which this organism might play in the development of an acute toxic gastro-enteritis, exclusive of outside sources of infection. The sterile filtrate of *B. enteritidis* experimentally fed was not sufficient to induce death in healthy mules, and it appears that the live organisms in the digestive tube are essential for the elaboration of additional poison.

"The relation of *B. coli*-like organisms constantly encountered in the internal organs of animals suffering from acute toxic gastro-enteritis could not be determined experimentally. It is believed, however, that a colon bacillosis is a common secondary invader. *B. enteritidis*, B. paratyphoid B, and B. paracolon appear closely related morphologically and culturally, and certain strains of the former and latter were identical serologically."

[Detection and control of avian diseases] (*California Sta. Rpt. 1919, p. 86*).—A study of the relative value of the intradermal and agglutination tests for the detection of *Bacterium pullorum* infection in mature fowls indicates that the intradermal test is unreliable. The intradermal tuberculin test was found to be fairly reliable for detecting tuberculosis infection in fowls.

Autogenous bacterins have proved to have neither curative nor immunizing value in the control of fowl cholera in turkeys.

"Safety first" in the poultry yard, W. C. THOMPSON (*New Jersey Stas., Hints to Poultrymen, 8 (1920), No. 6, pp. 4*).—The author discusses briefly the care of young chicks to secure adequate growth and the management of cases of constipation and prolapsed uterus among laying birds.

Artificial v. natural incubation: [Influence on bacillary white diarrhea of chicks], C. E. Brown (*Minnesota Sta., Rpt. Crookston Substa., 1917–18, pp. 84–86*).—The author reports the results of experiments conducted from 1912 to 1917 with a view to determining the influence of natural and artificial incubation upon white diarrhea in chicks. In 1912, 600 Barred Rock eggs laid by a flock affected with white diarrhea were secured. One half of these eggs were hatched artificially and the other half were hatched with hens. Enough of the more vigorous pullets of each flock were saved to produce eggs for the following year, and each year the eggs used were from the succeeding generation. The two flocks were always penned together, and the males mated with them each year were hen hatched.

The percentage of loss each year from white diarrhea in the artificially hatched lots has shown no indication of diminishing, amounting to 23.75, 38.5, 26.75, 30.75, 44.44, and 69.48 per cent, respectively, thus showing a material increase in 1917. Each season since 1913, 150 eggs from the naturally hatched line have been incubated artificially, with the result that with the exception of the first and second generation no traces of white diarrhea have been found. The percentage of loss from white diarrhea up to the age of 21 days, for the seasons of 1913 to 1917 from eggs artificially hatched, from the second, third, fourth, fifth, and sixth generations, respectively, of the naturally hatched line is as follows: 1913 chicks, 25 per cent; 1914, 4; and none for 1915, 1916, and 1917.

Chicken pox (epithelioma contagiosum) (*California Sta. Rpt. 1919, p. 85*).—It is reported that losses from this disease have been greatly reduced by the use of the vaccine described by Beach (E. S. R., 34, p. 784). It has been found that one injection usually produces sufficient immunity to protect fowls against natural infection for a year, although occasionally a second injection is necessary to stop the spread of the disease. Complete immunity does not result for from three to six weeks after vaccination. The immunizing value of the vaccine varies in direct proportion to the virulence of the virus contained therein. When properly administered the vaccine is said to be harmless to healthy fowls and also to have considerable therapeutic value for infected fowls.

In the preparation of the vaccine about 4 gm. of dried scab per bird can be produced on the Leghorn cockerels inoculated for the production of the virus. The mortality of the birds is about 50 per cent, the percentage of mortality being less and the amount of scabs produced per bird greater during warm weather or when the birds are kept in a warm room.

Turkey pox and chicken pox have been found to be mutually transmissible.

Chicken pox or contagious epithelioma, W. T. Johnson (*Washington Sta., West. Wash. Sta. Mo. Bul., 7 (1920), No. 12, pp. 199–204, figs. 5*).—The cause and symptoms of chicken pox are described, and detailed directions with illustrations are given for the vaccine treatment of affected flocks.

Intestinal roundworms expelled by tobacco dust (*California Sta. Rpt. 1919, p. 86*).—In cooperative investigations with J. E. Dougherty it was found that tobacco dust added to dry mash in the proportion of 1 lb. tobacco to 50 lbs. mash and fed daily for two or three weeks is an effective means of expelling intestinal roundworms from poultry. Good results were also obtained when tobacco dust was given in a single dose in dry mash, using 1 lb. for each 100 birds. The experiments indicate that it can be safely fed daily in the proportion of 1 lb. of tobacco to 50 lbs. of mash from the time the chicks are 70 days old and for periods of 20 days, with an interval of 20 or 30 days.

Oil of chenopodium also proved effective for expelling these parasites, when used at the rate of 1 teaspoonful for each 12 birds, mixed with moist mash.

As a single dose method of treatment the use of oil of chenopodium seemed to be more desirable than tobacco dust.

Sour milk treatment for poultry diseases (*California Sta. Rpt. 1919, pp. 85, 86*).—Observations extending over a period of three years show that coccidiosis in chicks and entero-hepatitis in turkeys have been promptly checked and birds successfully matured in infected yards when fed liberal amounts of sour milk with a restricted grain and mash ration.

RURAL ENGINEERING.

Agricultural surveying laboratory manual, D. SCOATES (*Agricultural College, Miss.: Author, 1918, 2. ed., pp. 99, figs. 15*).—This is the second edition of this manual (E. S. R., 30, p. 888), which is written primarily for students attending agricultural colleges.

Analysis of statically indeterminate structures by the slope deflection method, W. M. WILSON, F. E. RICHART, and C. WEISS (*Univ. Ill., Engin. Expt. Sta. Bul. 108 (1918), pp. 218, figs. 131*).—A very technical exposition of the subject is given.

Inspections and costs of run-off records, C. H. PIERCE (*Cornell Civ. Engin., 28 (1920), No. 4, pp. 164–169*).—The fundamental factors in determining the accuracy of stream-flow data are discussed. It is pointed out that in the final analysis the seasonal distribution of run-off and the effect of snow, ground, surface, and artificial storage introduce so many complications that exact comparisons of run-off can not be made, and that the discharge of each stream obeys a law peculiar to itself.

The coefficient of run-off of water courses in the interior [of France], P. MORIN (*Compt. Rend. Acad. Sci. [Paris], 169 (1919), No. 21, pp. 983–985*).—Studies on the relation between run-off and rainfall in the upper Cher River Basin are reported, covering the period from 1909 to 1918, inclusive.

It was found that this relation, called the coefficient of annual run-off, varied from 0.64 in 1910 to 0.39 in 1918. The deep subsoil of the basin is impervious, and the water which does not run off is evaporated. It is concluded that the coefficient of run-off depends directly on the amount of rainfall. Under conditions of equal rainfall, it was found that the coefficient of run-off is smaller when the rainfall is relatively heavier during the hot season.

Surface water supply of Colorado River Basin, 1916 (*U. S. Geol. Survey, Water-Supply Paper 439 (1919), pp. 198+XXXIV, pls. 2*).—This report, prepared in cooperation with the States of Arizona, Nevada, Utah, and Wyoming, presents results of measurements of flow made on streams of the Colorado River Basin during the year ended September 30, 1916.

Surface water supply of lower Columbia River Basin and Pacific Slope Drainage Basins in Oregon, 1916 (*U. S. Geol. Survey, Water-Supply Paper 444 (1919), pp. 190+LI, pls. 2*).—This report, prepared in cooperation with the States of Oregon and Washington, contains the results of measurements of flow made on streams in the lower Columbia River Basin and the Pacific Slope Drainage Basins in Oregon during the year ended September 30, 1916.

Gazetteer of streams of Texas (*U. S. Geol. Survey, Water-Supply Paper 448 (1919), pp. 267*).—This is a gazetteer of streams, lakes, and ponds as shown by the topographic maps of Texas.

Elements of western water law, A. E. CHANDLER (*San Francisco: Technical Pub. Co., 1918, rev. ed., pp. [4]+158+[6]*).—This is the second revised edition of this book (E. S. R., 31, p. 587), the purpose being to incorporate changes due to new legislation and judicial opinions.

Land clearing, M. J. THOMPSON (*Minnesota Sta. Rpt. 1919, p. 90*).—In a land-clearing project at the Duluth substation, begun in 1913, a 5-acre tract was cut off in 1913, sown to grass in 1914, pastured in 1915, 1916, 1917, and 1918, and almost entirely stumped in 1919. Two-thirds of the stumps were pulled by direct hitch with a team of horses, the other third being removed by dynamite or the stump puller. The cost per stump was 13.5 cts. for 20 per cent dynamite, 17.2 cts. for 30 per cent, and 16.7 cts. for 40 per cent. There was a saving in total cost of about 33 per cent over green clearing.

Terracing in Texas, J. C. OLSEN (*Tex. Agr. Col. Ext. Bul. B-51* (*1919*), *pp. 27, figs. 18*).—This bulletin gives general information on methods of terracing best adapted to Texas soils.

It is stated that the level-bench terrace is adapted to Texas conditions to only a limited extent, and can be recommended only for deep, porous soils which are too steep to permit the use of a cultivated terrace. The broad-base terrace, contouring a field with a light grade to conduct the surplus water away slowly, is the type best adapted to most parts of Texas. The best time to do terracing work in the State is in the late summer and fall after harvesting. A terracing table showing vertical fall between terraces, distance between terraces, and fall along terraces for different soils is given as follows:

Terracing table for Texas soils.

Item.	Vertical fall between terraces in feet.												
	1	1½	2	2½	3	3½	4	4½	5	5½	6	6½	7
Distance between terraces for heavy black land and soils with a large percentage of clay..feet..	200	165	135	115	100	94	88	83	78	74	70	67	65
Distance between terraces for sandy soils that wash easily, feet	185	140	115	95	89	84	80	76	72	68	65	62	60
Fall per 100 feet along the terrace, inches	0-3	1-4	4	3-4 4-5	(1) (3)	(1) (3)	(1) (3)	4 5	(2)	(3)	(3)	(3)	(3)
Base width to build terraces first year..feet..	22	22	22	21	21	20	20	19	19	18	18	17	16
Height, in inches, to build terraces above the watercourse when dirt is loose. Settles 25 per cent.	15	16	18	20	21	21	22	22	23	23	23	24	24
Minimum top width of water in watercourse when water is 9 inches deep..feet..	.....	.....	11	10	9	9	8	8	8	7	7	7	7
Linear feet of terrace per acre for distance between terraces given on line A	218	264	323	380	435	462	495	526	559	588	620	650	672

[1] Sandy loose soil.
[2] For sandy and loose soil.
[3] For heavy soils.

The use of a soil-saving dam and homemade equipment for terracing is also discussed.

Some theoretical studies on proportioning concrete by the method of surface area of aggregates, R. B. YOUNG (*Amer. Soc. Testing Materials Proc., 19* (*1919*), *pt. 2, pp. 444-457, figs. 6*).—Theoretical studies on the surface area method of proportioning concrete are reported, giving evidence to prove that the fineness modulus of an aggregate varies approximately as its surface area, although the former bears no mathematical relation to the latter. A formula is derived for the quantity of water required to gauge a mortar or concrete, from which a graph giving the relation between the compressive strength and cement content of a mortar or concrete is obtained. This is shown to be identical in form with the curves already obtained experimentally. It is shown further that if this formula for the water content of a mix is based on correct premises, the cement content of a mortar or concrete must vary with the surface area of the aggregate used if a constant water-cement ratio, and therefore a constant compressive strength, is to be maintained.

Cements producing quick-hardening concrete, P. H. BATES (*Amer. Soc. Testing Materials Proc., 19 (1919), pt. 2, pp. 425–438*).—Certain cements are described which have been prepared by the U. S. Bureau of Standards and which have the property of hardening very rapidly. These were made in a manner no different from that used in making Portland cement, but their composition differed very materially in that they were composed very largely of lime and alumina. These calcium aluminates, when they are very high in alumina, do not have a very rapid initial set but do harden very quickly and therefore produce early high strengths. Some of the maximum strengths were 3,145 lbs. per square inch for 1:6 gravel concrete at the end of 24 hours, 6,010 lbs. per square inch at the end of seven days, and 8,220 lbs. per square inch at the end of one year. Experiments with a similar cement are reported. It is the opinion that both of these cements commend themselves for certain special uses where quick-hardening concrete of high strength is desired, but that neither would be desirable where subjected to the continued action of water.

Relation between methods of curing standard concrete test specimens and their compressive strength at 28 days, H. W. GREEN (*Amer. Soc. Testing Materials Proc., 19 (1919), pt. 2, pp. 607–618, figs. 2*).—Investigations to determine what effect exposure to the drying properties of the air would have upon the compressive strength of concrete test specimens that had been buried in moist sand for different periods of time are reported. It was found that (1) the careful curing of concrete test specimens is as important an item, when uniform results are desired, as proportioning the aggregate or mixing the batch, (2) the variation between specimens cured properly and improperly is often over 100 per cent, (3) the longer concrete remains moist the higher will be its compressive strength, and (4) the compressive strength of test specimens buried in moist sand may be increased by exposing them to the drying effects of the air.

Modulus of elasticity of concrete, S. WALKER (*Amer. Soc. Testing Materials Proc., 19 (1919), pt. 2, pp. 510–585, figs. 37*).—Compression tests on about 3,500 6 by 12-in. concrete cylinders are summarized. The relation between the modulus of elasticity and strength of concrete was studied for the following variables: Size and grading of aggregate, kind of aggregate, quantity of cement, consistency of concrete, age at test, time of mixing, and curing conditions of concrete. The tests show that the modulus of elasticity is affected by these variables in a similar manner to the strength.

Tests are also reported which show that the gauge length over which the deformations are measured do not appreciably affect the determination of modulus of elasticity. A study of the stress-deformation data for the tests shows that the relation may be represented by the equation, $s=Kd^n$, where s=unit stress of concrete, d=unit deformation of concrete, K=a constant depending on the strength of the concrete, and n=an exponent, approximately constant. This equation applies for stresses below 50 to 90 per cent of the ultimate strength.

Tests on concrete of a number of different consistencies, sizes, and gradings of aggregate, mixes ranging from 1:15 to about 1:3, and ages ranging from seven days to one year show that there is a general relation between modulus of elasticity and strength of concrete, but that this relation is not linear. The relation may be represented by an equation of the form, $E=CS^m$, where

E=modulus of elasticity of concrete, C=a constant depending on the conditions of the test, S=compressive strength of concrete, and *m*=an exponent.

The initial tangent modulus for usual concrete mixtures is represented by the equation, $E_i=33,000\ S^{\frac{1}{2}}$. For the tangent modulus at 25 per cent of the compressive strength the equation becomes $E_{t}25=66,000=S^{\frac{1}{2}}$.

A nomographic chart showing the interrelation of mix, consistency, size, and grading of aggregate, strength, and modulus of elasticity is presented.

A study of data from other sources shows that the stress-deformation relation of a great number of other materials, including various woods, metals, stone, brick, brick piers, rubber, rope, and concrete of many kinds, may be represented by a relation of the same form as that given for concrete.

Pressure of concrete in forms, G. Paaswell (*Engin. and Contract., 53 (1920), No. 8, pp. 208, 209*).—Experimental data on the subject are summarized, and an empiric formula, together with a table of data to show the pressure of concrete in forms, is given. The final formula arrived at is as follows:

$$P=A\ wh^2/2,\ \text{where}\ A=\frac{1-e^{-kt^2}}{kt^2}$$

In this formula P is the unit pressure on a vertical surface at a given point below the top of the concrete in pounds per square foot; *h* is the head of concrete in feet; *w* is the weight of concrete; *e* is the base of natural logarithms; *k* is a parameter; and *t* is the time elapsed since the point at *h* was poured, in hours; A is a coefficient. The parameter *k* is determined by the following formula:

$$k=\frac{1}{to^2}\log_e(20/19)$$

More light on protecting concrete against fire (*Engin. News-Rec., 84 (1920), No. 10, pp. 469, 470*).—Tests are reported which show that limestone aggregate is highly fire resistant, and is preferable in this respect to highly siliceous gravels. Where highly siliceous aggregate is to be used, the use of high-weight, large-mesh reinforcement in the outer concrete is recommended.

Paint, a plastic material and not a viscous liquid: The measurement of its mobility and yield value, E. C. Bingham and H. Green (*Amer. Soc. Testing Materials Proc., 19 (1919), pt. 2, pp. 640–664, figs. 8*).—In this paper the differences between the viscous and plastic substances are pointed out, and paint is shown to be a plastic material and not a viscous liquid. It is thus classified as a solid and is referred to as being rigid or mobile. The plastometer, an instrument designed to determine the mobility and yield values of plastic substances, is described and its method of use discussed. Formulas for calculating these properties from laboratory measurements are derived.

Experimental data from the use of the apparatus are presented and discussed.

First biennial report of the California Highway Commission, N. D. Darlington et al. (*Bien. Rpt. Cal. Highway Comn., 1 [1917–18], pp. 142, pls. 30, figs. 4*).—This is a report of the work and expenditures of the California Highway Commission for the biennial period ended December 31, 1918. It deals with highway legislation in the State, includes data on the design and construction of highways, and reports the results of laboratory tests of construction materials, including especially concrete and road oil.

Highway inspectors' handbook, P. Hubbard (*New York: John Wiley & Sons, Inc., 1919, pp. XXVI+372, figs. 56*).—This is a handbook for inspectors, engineers, and contractors, in which the author has presented briefly most of the important details of highway construction and maintenance in such form as to be quickly available. Use is made of a large number of diagrams in place of the customary tables. Each general subject is divided into articles, the following subjects being included: Highway inspection; broken stone; gravel, sand, and clay; hydraulic cement; bituminous materials; laboratory tests of bituminous materials; inspection of sand-clay, gravel, shell, and shovel-run or crusher-run slag roads; inspection of broken stone and broken slag roads; inspection of bituminous surface treatments; inspection of bituminous macadam pavements; inspection of concrete foundations and pavements; bituminous paving plant inspection; inspection of bituminous concrete and sheet asphalt pavements; inspection of brick and block pavements; inspection of miscellaneous work and materials; measurements; miscellaneous field testing and sampling equipment; records and reports; and typical material requirements.

The turnpikes of New England, F. J. Wood (*Boston: Marshall Jones Co., 1919, pp. XVII+461, pls. 102, figs. 16*).—This book deals with the engineering, economic, and archaeological aspects of the turnpikes and toll bridges of New England.

The proper width of a permanently paved highway, M. L. Patzig (*Munic. and County Engin., 58 (1920), No. 2, pp. 66, 67*).—Data on highway widths for different purposes are reported, and it is concluded that 20 ft. is not an unreasonable minimum width.

Standard specifications for brick pavements, M. B. Greenough (*Munic. and County Engin., 58 (1920), No. 2, pp. 57–61*).—The history of brick pavements is briefly reviewed and the new standard and alternate specifications are discussed. The author points out the value of thorough subsoil drainage for the base of brick pavements, and of the use of a variety of kinds of bases to meet different subsoil, traffic, and economic conditions. Experience indicates that tendency of design is away from the slab type of brick pavements and toward the types that depend upon the high quality of the individual unit. The use of the cement grout filler is being discontinued, and the adoption of the standard brick is becoming widespread.

Fundamental considerations affecting concrete pavement design, S. T. Morse (*Munic. and County Engin., 58 (1920), No. 2, pp. 62–66*).—Data on the design of concrete pavements from different sources are summarized, and a mathematical analysis is made of different design factors. Tabular data are given showing the required thickness and relative cost per square yard of wide and narrow pavements.

Utilizing old macadam to increase width of concrete road (*Engin. News-Rec., 84 (1920), No. 10, pp. 461–463, figs. 3*).—Reconstruction of old macadam roads by building a concrete surface in two strips with the old surface left in the middle, is described, as done by the New York State Highway Department. After the concrete has been constructed the macadam receives a bituminous surface. By this design the old surface is utilized for foundation where it is in the best condition, an extra wide road is obtained, and it is easy to keep roads open to traffic during construction.

Cost data are included.

Service the final test of quality of road stone, H. E. Breed (*Munic. and County Engin., 58 (1920), No. 2, pp. 51, 52*).—The author reviews a number of different tests of road stone and points out the value of the impact test. He concludes that road stone must be considered in relation to its particular function in a specified type of pavement. The concrete type is better built with stone the wearing quality of which is most nearly commensurate with that of the matrix, or a stone with a French coefficient of from seven to nine.

Bituminous surface treating work, D. O. STONE (*Cornell Civ. Engin., 28 (1920), No. 4, pp. 170–178, fig. 1*).—The organization and forms used by the Ohio State Highway Department are described and illustrated.

Field manual: Instructions for making bridge and culvert surveys (*[Des Moines]: Iowa Highway Comm., 1919, pp. 25*).—This outline of instructions for making bridge and culvert surveys is based on recent practice of the Iowa Highway Commission.

Proposed farm power studies (*U. S. Dept. Agr., Off. Sec. Circ. 149 (1920), pp. 8*).—This circular reports the proceedings of a conference on farm power problems held in Chicago on October 6 and 7, 1919, by representatives of the U. S. Department of Agriculture and of State colleges and various agricultural and trade organizations, in which it was recommended that Congress be asked to make adequate appropriation for fundamental studies of farm power problems to be undertaken by the Department in cooperation with the colleges. Pursuant to this recommendation a Departmental committee was appointed by the Secretary of Agriculture to take charge of farm power projects, which suggested the following seven projects: (1) The testing and rating of farm tractors, (2) the determining of the working rating of horses, (3) the measurement of power requirements of machines and implements, (4) the development of practical methods of expanding the power of farm horses, (5) the determination by field studies of the mechanical efficiency of horses as power units, (6) the increasing of the economic efficiency of horse and tractor power by the readjustment of the size of the farm and the combination of enterprises, and (7) the compiling of accurate data concerning farm power demands and the relative cost of meeting these demands by the various kinds of power on farms.

Efficiency in the use of oil fuel, J. M. WADSWORTH (*Washington: U. S. Dept. Int., Bur. Mines, 1919, rev. ed., pp. 86, pls. 3, figs. 18*).—This is a handbook of information for boiler-plant and locomotive engineers who are intimately associated with the use of oil fuel.

Theory and practice of plantation transportation, L. W. ALWYN-SCHMIDT (*Sugar [New York], 22 (1920), No. 2, pp. 70–73, figs. 2*).—This is a discussion of the use of motor trucks and tractors for sugar-plantation transportation.

Tractor activities throughout Nation (*Farm Machinery, No. 1466–67 (1920), pp. 11–17*).—Replies from 44 agricultural colleges and experiment stations to a questionnaire relating to the status of the tractor industry are reported. The questionnaire includes for the respective States an estimate of farm tractors in use, a statement of the economic advantage of power farming as compared with horse power, the principal objections in the State against tractors, plans for the education of farmers in the operation of power machinery, and the best size of tractor for use in the State.

Directory and specifications of farm tractors (*Farm Machinery No. 1472–73 (1920), pp. 13–31, figs. 125*).—This directory includes specifications with illustrations for 314 tractors of 222 different makes.

Analytical dynamometer tests of agricultural machinery, M. CONT (*Univ. Nac. Buenos Aires, Rev. Facult. Agron. y Vet., 2 (1919), No. 3, pp. 343–348, figs. 2*).—Tests of different agricultural machines as conducted in Argentina are discussed.

Power-distribution tests of a grain binder showed that 16.5 per cent of the power was utilized by the sickle, 7.1 per cent by the reel, 22.9 per cent by the canvas platform, 42.2 per cent by the canvas elevator, and 9.3 per cent by the binder proper. Tests of a grain separator operated by electric motor showed that 22.22 per cent of the power was utilized by the cylinder, 13.89 per cent by the extractor, ventilator, and sifter, 5.56 per cent by the grain and chaff elevator, 22.22 per cent by the automatic feeder, and 36.11 per cent by the blowing stacker. A brief test of a corn sheller showed that it required about five times as much power to operate the sheller when shelling corn as when running empty.

Care and operation of farm machinery, E. MORANDI (*La Mano d'Opera e le Macchine Agrarie. Piacenza: Fed. Ital. Consorzi Agr., 1916, pp. 73, figs. 45*).—This pamphlet deals especially with tillage machinery, and contains an appendix by P. Ceresta-Costa on the use of tractors and motor plows in Italian agriculture.

Stone roller for thrashing jowar (*Dept. Agr. Bombay Leaflet 6* (*1917*), *pp. 2 pl. 1*).—A stone roller for thrashing sorghum is described and illustrated. The roller is 32 in. long and 22 in. in diameter. The axles are set in lead at the two ends of the roller and revolve in iron bearings. The whole rests in a wooden frame. With one man and two cattle drawing the roller the same amount was thrashed in 3½ hours as in 8 hours by the old method of treading by cattle and at one-seventh of the cost. The thrashed grain was undamaged.

Booms for spraying truck crops, L. B. SMITH and H. H. ZIMMERLEY (*Virginia Truck Sta. Bul. 28* (*1919*), *pp. 83–98, figs. 6*).—This bulletin describes the construction of booms or structures for conducting spray material to and supporting the nozzles, which have been found best adapted for the spraying of potatoes, tomatoes, spinach, and kale in eastern Virginia.

The potato boom is arranged to spray four rows. There are three straight nozzles to each row, one of which is vertical and the other two lateral. Under eastern Virginia conditions the spring crop of potatoes should receive the first spray when the plants are about 8 in. tall. For this application it is best to regulate the height of the boom to bring the lateral nozzles about 6 in. above the ground. This height may be maintained for the second spraying. For the third and succeeding applications, the height should be regulated to bring the vertical nozzles not less than 12 in. or more than 15 in. above the top of the plants. Among the crops, other than potatoes, which may be sprayed with this boom, are bush beans, soy beans, cabbage, sweet corn, and peas.

The tomato boom is an adaptation of the potato boom, and is designed to spray tomatoes and eggplants, grown in rows 5 ft. apart. It has been found impractical to attempt spraying tomatoes with a traction or power outfit when the rows are closer together. There are three nozzles to each row, arranged in a manner similar to those on the potato boom. The arms are curved to give the lower nozzles a slight upward angle, and are fitted with a double elbow at the point of attachment to the secondary supply pipe. This permits them to be adjusted to conform to the size of the plants.

The spinach boom is designed for spraying four rows of spinach, each 10 in. apart, on a bed 5 ft. wide. The nozzles are pointed in a forward direction and are supported on U-systems. This arrangement was devised during recent experiments in spraying spinach for the control of aphids. Each U-system is composed of one tee No. 6, two elbows No. 7, two elbows No. 9, two close nipples E, two nipples F, two nipples G, and two nozzles No. 8. Elbows Nos. 7 and 9 permit the nozzles to be adjusted in vertical and horizontal planes, respectively. During the operation of spraying the U-systems pass between and not over the rows. There are two nozzles pointed at angles of about 20° toward the rows or so arranged that the center of the cone of spray strikes the plants about 24 in. in front of the nozzles. Experience has shown that the spinach boom equipped with this arrangement of nozzles is an exceedingly satisfactory outfit for spraying large acreages of cucumbers and cantaloups.

The kale boom is constructed on the same principle as the spinach boom. It is designed for spraying six rows 20 in. to 30 in. apart. The U-systems are carried between the rows and the nozzles are directed at angles of about 30° toward the plants.

Farm buildings and tools (*California Sta. Rpt. 1919, pp. 90–93*).—Miscellaneous studies of farm buildings and farm tools are reported. A list of plans of farm buildings prepared by the agricultural engineering division and available for distribution is given. The results of a study of dairy buildings resulted in the design of an experimental milk house, the significant features of which are a smooth washable interior, well insulated walls of tile, and an insulated ceiling.

Tests of the usual forms of spark arresters for tractors showed that the centrifugal type is more efficient than any of the screen types. Tests to determine the relative merit of several standard and commercial wood preservatives for silos indicated that heavy creosote oil is as satisfactory as others and cheaper.

Data as to the tractive resistance of farm wagons on different road surfaces are summarized.

RURAL ECONOMICS.

The influence of wheat and cotton on Anglo-American relations during the Civil War, L. B. SCHMIDT (*Iowa Jour. Hist. and Politics, 16 (1918), No. 3, pp. 400–439*).—This paper analyzes the balance between Great Britain's economic dependence upon the United States for cotton and for wheat, indicating that the maintenance of England's neutrality during the Civil War depended upon the more serious consequences anticipated from the food famine which would have resulted from the cutting off of the supply of northern wheat rather than upon the risk of a cotton famine. Statistics of the production of the two commodities in the United States immediately preceding and during the Civil War, the production in the United Kingdom, and the importation by the latter from her colonies and from foreign countries, are reviewed; and the development of England's final policy is illustrated by quotations from contemporary debates.

The farmer and foreign exchange, S. SOSLAND (*Mich. Farmer, 154 (1920), No. 11, p. 395, fig. 1*).—This article sketches the effect of the foreign exchange situation as tending to reduce foreign trade in farm products and to increase the sale of European food products in this country.

Why the price of farm land varies, G. W. NORRIS (*Farm Jour., 44 (1920), No. 4, pp. 26, 102*).—The suggestion is made that the generally lower farm land values in the eastern industrial States are due to the drain of city industry upon farm labor supply and managerial ability.

Information on land values, L. A. EVANS (*Tasmania Agr. and Stock Dept. Rpt. 1918–19, pp. 20–24*).—This gives notes on land values in the rural districts of Tasmania where the land has been partially improved by the clearing of the timber and the sowing of artificial grasses.

[Land tenure and settlement and agriculture in Australia], G. H. KNIBBS (*Off. Yearbook Aust., 12 (1901–1918), pp. 237–402, figs. 6*).—Information previously noted (E. S. R., 41, p. 493) is continued for the latter year.

Russian agrarian reform, W. D. PREYER (*Die Russische Agrarreform. Jena: Gustave Fischer, 1914, pp. XIV+415, pls. 10*).—A detailed survey of the history of Russian peasant unrest from its early manifestations to the revolution of 1905 and 1906, difficulties both to peasants and large landholders arising out of concessions in the way of allowing peasants to acquire land, the gradual dissolution of the common field system and the assembling of peasant holdings, the encouragement of free colonization of Siberia, and the organization and activities of agrarian commissions and of the peasant bank are noted. The author urges the importance to a nation's agrarian development of a conservative land-holding middle class, and also of adequate statistical information. Further reforms recommended for individual and group organization and for interior colonization are outlined, and a bibliography of German and Russian sources is appended.

The employment of women in agriculture in England and Wales (*Wages Bd. Gaz., 2 (1920), No. 37, pp. 83–90*).—Statistics are given which were obtained from answers to an inquiry form sent quarterly to a number of farmers in England and Wales since April, 1915.

On the basis of answers of about 7,000 farmers this report is made, dealing first with the numbers of women engaged in agriculture in each division of the country and the proportion which they bear to the number of men employed both regularly and casually, and in the second place with conditions which lead to the employment of women or the reverse. England and Wales were divided into ten groups of counties classified according to the number of women employed regularly in agriculture in 1914 in proportion to the number of men so employed. The counties were arranged into groups, including first all those where the proportion in 1914 was as one woman to four men or less, others in which the number of men employed regularly was, respectively, 5 to 10, 11 to 20, and 21 to 30 times the number of women so employed, and one in which very few women were employed regularly in 1914. Changes brought about in this respect during the war are noted, and a table is given showing the number of men to each woman regularly employed in agriculture in each division of England and Wales in July, 1914 to 1919, inclusive. It is noted that the counties where the proportion of women regularly employed to men so employed is the lowest were practically the same in 1918 as in 1914.

How Denmark has prospered, W. R. BIRKS (*Sci. and Indus.* [*Aust.*], *2 (1920), No. 1, pp. 52–59*).—This is an account of the visit of a group of men selected from the Australian army to study the agricultural methods of certain countries to farms and other typical agricultural enterprises in Denmark.

Testing farms in the South for efficiency in management, C. L. GOODRICH (*U. S. Dept. Agr., Dept. Circ. 83 (1920), pp. 27*).—This has been essentially noted in another form (E. S. R., 40, p. 789).

The results of double entry bookkeeping in an agricultural enterprise (*Ann. Agr. Suisse, 19 (1918), No. 1, pp. 41–114; 20 (1919), No. 3, pp. 295–316*).—The principal results obtained on an institutional farm under the supervision of the Swiss Peasants' Union are reproduced and interpreted in order to illustrate the value and practicability of double-entry bookkeeping for farm accounts. The data cover the fiscal years ended April 30, 1916–17, and 1918–19.

Home supplies furnished by the farm, W. C. FUNK (*U. S. Dept. Agr., Farmers' Bul. 1082 (1920), pp. 19, figs. 28*).—This gives graphic illustrations suggesting the utilization of farm supplies in the family living. The discussion is based on data previously noted (E. S. R., 32, p. 487; 36, p. 289).

The necessity for the organization of agricultural interests, T. N. CARVER (*Ann. Rpt. Conn. Sta. Bd. Agr., 50 (1918), pp. 60–72, pl. 1*).—A discussion of the advantages of standardization and advertisement in the marketing of farm products.

Report of the State Bureau of Markets and Marketing, V. H. DAVIS ([*Ohio Dept. Agr.*], *State Bur. Markets and Marketing Rpt. 1917–1919, pp. 18*).—This outlines the investigational activities, organization, and demonstration and other extension-service work of the Ohio Bureau of Markets and Marketing, also legislation relating thereto.

Farmers' Market Bulletin (*North Carolina Sta., Farmers' Market Bul., 7 (1920), No. 33, pp. 23, figs. 3*).—This number contains a brief article on spring measures for sweet-potato disease control, the usual partial list of products which farmers have for sale, notes of public sales of purebred live stock, and a spraying calendar for apples in North Carolina.

The Market Reporter (*U. S. Dept. Agr., Market Rptr., 1 (1920), Nos. 10, pp. 145–160, fig. 1; 11, pp. 161–176, fig. 1; 12, pp. 177–192, fig. 1; 13, pp. 193–208, fig. 1*).—This continues weekly and monthly summaries of the movement, marketing, and prices of specified commodities, and tabulated statistics with interpretative text in regard to important classes of agricultural products.

Leading articles appearing in No. 10 briefly describe the manner and importance of gathering market information, especially with reference to fruit and vegetables, and present a discussion of the February meat trade; No. 11 takes up the onion market season and the movement to eliminate many of the sizes of standard containers. The latter numbers shows also the receipts and disposition of the principal classes of live stock at public stockyards February, 1919 and 1920. No. 12 contains leading articles, one outlining the dairy and market news service of the Bureau of Markets, the other discussing the subject of farmers and foreign exchange, also a monthly cold storage report showing holdings on March 1, 1920, and February 1, 1918, 1919, and 1920. No. 13 gives an analysis of the hay market situation and of price ranges of honey during the past three seasons.

Monthly Crop Reporter (*U. S. Dept. Agr., Mo. Crop Rptr., 6 (1920), No. 2, pp. 9–20*).—The usual monthly estimates of acreage and production of specified crops, and data as to the farm and market prices for various agricultural products, are continued. This number relates mainly, however, to the number and value on farms, average prices by age, class or selling unit, and marketing, trade, and aggregate value comparisons of the principal classes of live stock. Estimates are given of the number of cattle, swine, and sheep in leading countries of the world before and after the war.

Monthly Crop Reporter (*U. S. Dept. Agr., Mo. Crop Rptr., 6 (1920), No. 3, pp. 21–32, figs. 3*).—This number contains the usual estimates of acreage and production and data relating to farm and market value of important products, a crop summary for March, and many other statistics of farm stocks, crop acreages, production, exports, and prices. A comparison is made of the prices of 88 articles bought by farmers in the years 1909, 1914, 1918, and 1919, and of the average value of plow lands in 1918, 1919, and 1920 by States. Trends in agricultural statistical data by index numbers and by percentage changes yearly are shown.

What Brazil buys and sells, L. DE AFFONSECA, JR. (*Rio de Janeiro, Brazil: Min. Agr., Indus., and Com., 1918, pp. XXIX+101+[1]*).—In this are given statistics of the numbers of live stock in Brazil and of the approximate output of various agricultural products and their exportation during the last five years.

Acreage and live stock returns of Scotland (*Agr. Statis. Scot., 7 (1918), pt. 1, pp. 57*).—Information previously noted (E. S. R., 41, p. 594) is continued for 1918.

The products of French East Africa, G. FRANÇOIS (*Les Productions de l'Afrique Occidentale Française. [Paris]: Min. Colon., 1918, pp. 156+[3]*).—This gives a detailed report on the agricultural resources of the region, covering descriptive and statistical information as to oil-producing and textile and fiber plants, cereals, legumes, root crops, forest products, fruits, live stock, and fish.

Agricultural conditions in South Africa, F. D. FISHER (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Com. Rpts., No. 63 (1920), pp. 1499–1501*).—This article notes briefly climatic conditions, characteristics of the rural population of the Johannesburg consular district, the topography of the region and its effect on temperature, precipitation in various parts of the Union, and physical features and fertility of Rhodesia.

AGRICULTURAL EDUCATION.

The field in farm management demonstrations, H. C. M. Case (*Jour. Farm Econ., 2 (1920), No. 1, pp. 9–22*).—The history of farm management demonstration work, which had its origin in farm surveys conducted in 1912 and 1913, is briefly reviewed. This is followed by a consideration of the various agencies, e. g., the county agent, agricultural high-school teachers, and bankers with whom the farm management demonstrator may cooperate, and the assistance that the people representing these agencies can be expected to give, judging from their past training and experience; an analysis of the methods used in the past, viz, work with individual farmers, with small community groups of farmers, and with large extension school groups in giving instruction in farm accounting and problems in farm organization and management; and suggestions for the advancement of farm management demonstration work.

[Report on the work of the extension service] (*California Sta. Rpt. 1919, pp. 101–108*).—This is a report on the progress in the organization and work of farm advisor work in organized counties in cooperation with county farm bureaus; home demonstration work in organized counties through the county farm bureaus; agricultural club work through the county farm bureaus and the public schools; extension schools and demonstrations, correspondence courses in agriculture, vocational teachers' training classes, and rehabilitation courses at the university farm school; fair exhibits, etc.

Report of the division of extension in agriculture and home economics for the period of eight months ending June 30, 1918, A. Agee et al. (*New Jersey Stas. Rpt. 1918, pp. 99–144, fig. 1*).—This includes the administrative report of the director of the extension division and the reports of the leaders of farm demonstration, home demonstration, and boys' and girls' club work.

Definite results are reported concerning the organization and relationship of the county boards of agriculture to women's work. With regard to boys' and girls' club work the conclusions have been reached that club work is essential and should form a definite part in the scheme for the education of boys and girls, particularly those who live in rural communities. The school is deemed the main institution through which these activities should be promoted, but all other public and semipublic institutions should be coordinated with it in the work. The understanding with the State Department of Public Instruction is fundamentally sound, and the relations should be even closer than they are at the present time. Not only would the interests of club work, but those of extension and general education work as well, be more efficiently served if a somewhat closer relation could be established between club leaders and the county farm bureaus. Paid county leadership is necessary to the performance of satisfactory club work, and ultimately there should be county leaders on full time in all organized counties.

The extension of education to the American farmer, J. G. Merrison (*Jour. Bd. Agr. [London], 26 (1916), No. 9, pp. 881–891, pl. 1, figs. 4*).—The author describes the organization, objects, and methods pursued by the extension department of the International Harvester Company in its educational and propaganda work, by means of demonstration trucks and farms, the distribution of literature, the visual method, and the "Safe Farming" newspaper service.

The school and the soil, and the soil and the farmer, H. Dörfler (*Landw. Jahrb. Bayern, 8* (*1918*), *No. 3, pp. 155–171*).—The author discusses means of developing the agricultural instruction for the farming population of Germany, and of fostering a greater personal responsibility on the part of the farmer in his sphere of work and toward the public.

He recommends that the present system of agricultural instruction for farmers, consisting of instruction for adults by means of demonstrations and farm papers, and of instruction for farm boys in winter schools, which is deemed of only sporadic value, be reorganized, and suggests that in order to reach the rural masses the teaching of the spirit of the soil should be begun in the rural school as soon as the technical difficulties of reading and writing have been overcome, by giving the regular school subjects an agricultural trend. Further, Sunday and evening classes in theoretical instruction should be held for farm boys who have completed the rural school course and are beginning work on the farm. This instruction should be adapted to local conditions and work seasons, and should be supplemented by exhibitions and a study of farm machinery and implements. These classes should not be conducted in the usual question-and-answer school system, but in a more informal manner, and will be possible only where the services of the regular school teacher can be utilized for the agricultural instruction. This would necessitate training courses for teacher-students and teachers in service, which could be given by the agricultural instructor during vacations or at the usual teachers' meetings.

It is further recommended that agricultural illustrative material be extended and studied more intensively, and that the school garden be used for variety tests, fertilizer experiments, etc., as an introduction to practical work. The plan outlined is considered only a necessary preparatory step toward the ideal, namely, the expansion of these evening classes and the public continuation school into public obligatory vocational agricultural schools. With the introduction of the latter, the instruction in the agricultural winter schools would need to be reorganized to meet the needs of the more promising or efficient agricultural students, and to train managers, cooperative officials, subordinate State officials, etc. The preparatory training they are at present obliged to give could be discontinued and its course reduced from two winter half years to one.

A textbook of commercial geography, C. C. Adams (*New York: D. Appleton & Co., 1918, rev. ed., pp. XVI+508, pls. 18, figs. 156*).—The contents of this text have been limited to the commodities entering most extensively into trade because of their greater educational value in any attempt to elucidate for the classroom the nature of commerce and its underlying principles. Chapters are included for the United States on the climate, natural features, and distribution of leading products; vegetable food products, beverages, tobacco, and the trade in them; animal food products and the trade in them, and the horse, whales, sponges, and furs; vegetable and animal fibers—oils from the seed of fiber plants; and wood crops, the commodities they yield, and the trade in them. The agricultural products of foreign countries are also dealt with.

Selection and care of clothing, L. I. Baldt (*U. S. Dept. Agr., Farmers' Bul. 1089* (*1920*), *pp. 32, figs. 10*).—Practical suggestions are offered with reference to a spending plan for clothing, including the freshening and remaking of old garments; the selection of clothing as regards suitability of material, design, and color, and including general facts about textiles; and simple home testing of textile goods; and the care of clothing.

MISCELLANEOUS.

Thirty-second Annual Report of Alabama College Station, 1919 (*Alabama Col. Sta. Rpt. 1919, pp. 35*).—This contains the organization list, a financial statement for the Federal funds for the fiscal year ended June 30, 1919, and reports of the director and heads of departments on the work of the station during the year. The experimental work reported is for the most part abstracted elsewhere in this issue.

Annual Report of California Station, 1919 (*California Sta. Rpt. 1919, pp. 163, pl. 1*).—This contains the organization list; a report of the director consisting mainly of a summary of the research work of the station during the three years ended June 30, 1919, an account of other activities of the station, and a brief note on the new plan of administration; and an appendix containing lists of the various station projects and publications of the year and a report of the reconstruction committee of the College of Agriculture as to post-war activities. The experimental data reported are for the most part abstracted elsewhere in this issue.

Twenty-seventh Annual Report of Minnesota Station, 1919 (*Minnesota Sta. Rpt. 1919, pp. 95*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1919, and reports of the director, heads of divisions, and the various substations. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Report of the superintendent, Northwest Experiment Station, 1917 and 1918 (*Minnesota Sta., Rpt. Crookston Substa., 1917–18, pp. 99, figs. 25*).—This contains the organization list and a report of the superintendent of the substation in 1917 and 1918, including several special articles by members of the staff. The experimental work reported is for the most part abstracted elsewhere in this issue.

Annual Report of New Jersey Stations, 1918 (*New Jersey Stas. Rpt. 1918, pp. XXIV+302, figs. 2*).—This contains the organization list of the stations, a financial statement for the College Station for the fiscal year ended June 30, 1918, and for the State Station for the period from November 1, 1917, to June 30, 1918, a report by the director (E. S. R., 40, p. 797), and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Annual Report of South Dakota Station, 1919 (*South Dakota Sta. Rpt. 1919, pp. 35*).—This contains a report by the director on the organization, work, and publications of the station, and departmental reports, of which that of the agronomist and entomologist and portions of that of the horticulturist are abstracted elsewhere in this issue.

Monthly Bulletin of the Ohio Experiment Station (*Mo. Bul. Ohio Sta., 4 (1919), No. 12, pp. 363–391, figs. 10; 5 (1920), No. 1, pp. 3–32, figs. 4*).—These numbers contain, in addition to several articles abstracted elsewhere in this issue and miscellaneous notes, the following:

No. 12.—Usefulness of Production Records in Dairy Management, by A. E. Perkins, and Index.

No. 1.—The Ohio Agricultural Experiment Station, Its Government and Work, this being the reply of the station to an inquiry by the State Joint Legislative Committee on Administrative Reorganization as to the Government and work of the station and its relations with other State institutions.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta. Mo. Bul., 7 (1920), No. 12, pp. 193–208, figs. 5*).—In addition to articles abstracted elsewhere in this issue, this number contains a brief article entitled: Winter Management of Sheep in Western Washington, by C. M. Hubbard.

NOTES.

Cornell University and Station.—The largest appropriations ever granted any State college of agriculture have just been approved by the governor. The college receives an increase of almost $300,000 over the previous year for salaries and running expenses. In addition $500,000 is made immediately available for new buildings, with $2,500,000 more authorized under the building plan. The total State appropriations for the college for the year will aggregate about $1,800,000.

It is expected that the enlarged maintenance grant will afford opportunity for considerable increases in salary. More discretion is afforded the executive staff in this matter than under the former "segregated budget" system. Two new executive positions are established, one that of vice-dean of resident instruction, and the other that of vice-director of the station. Further extension of the rural marketing and finance work was also authorized.

The old insectary built in 1886 by Prof. Comstock has been razed to make room for the new chemistry building.

G. W. Tailby, sr., superintendent of the horse barn, has retired after 44 years' service.

American Association of Soil Survey Workers.—This organization was formed at a conference of representatives of soil survey work in the Upper Mississippi Valley States, held in Chicago, February 6 and 7. This conference was held to consider ways and means of establishing closer cooperation between the State and Federal soil surveys. Among the subjects taken up were the extent to which new soil types should be established, the basis of mapping and classifying soils, methods of soil mapping, nomenclature, the uses of the soil survey and its relation to other activities and industries, soil survey reports and joint publications, supervision of field work, inspection, etc., mechanical analyses, and correlative laboratory work, using the soil type as a basis and taking up such studies as adsorption, colloids, water holding capacity, etc.

The objects of the new association as outlined in the constitution are to establish a closer relationship among the soil survey workers of the various States, to provide a medium through where there may be a free discussion of problems arising in soil survey work, and to aid in developing a closer cooperative relationship between the States and the Bureau of Soils of the U. S. Department of Agriculture, to the end that greater uniformity may be secured in the work. Membership is open to all persons in the United States and Canada engaged in soil survey work. Meetings are to be held annually, with additional sectional meetings at various experiment stations during the summer.

Officers elected for the ensuing year include A. R. Whitson, University of Wisconsin, president, M. F. Miller, University of Missouri, vice-president, and W. J. Geib, University of Wisconsin, secretary-treasurer. Provision has also been made for standing committees on soil classification and nomenclature, utilization, field methods, correlative laboratory work, and legislation.

American Association of Agricultural College Editors.—This association will hold its eighth annual meeting at the Massachusetts Agricultural College, Amherst, Mass., from June 30 to July 2.

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